ESSM Position Statement “Sexual Wellbeing After Gender Affirming Surgery”

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ABSTRACT

Introduction: Much has been published on the surgical and functional results following Gender Affirming Surgery (‘GAS’) in trans individuals. Comprehensive results regarding sexual wellbeing following GAS, however, are generally lacking.

Aim: To review the impact of various GAS on sexual wellbeing in treatment seeking trans individuals, and provide a comprehensive list of clinical recommendations regarding the various surgical options of GAS on behalf of the European Society for Sexual Medicine.

Methods: The Medline, Cochrane Library and Embase databases were reviewed on the results of sexual wellbeing after GAS.

Main Outcomes Measure: The task force established consensus statements regarding the somatic and general requirements before GAS and of GAS: orchiectomy-only, vaginoplasty, breast augmentation, vocal feminization surgery, facial feminization surgery, mastectomy, removal of the female sexual organs, metoidioplasty, and phalloplasty. Outcomes pertaining to sexual wellbeing- sexual satisfaction, sexual relationship, sexual response, sexual activity, enacted sexual script, sexuality, sexual function, genital function, quality of sex life and sexual pleasure—are provided for each statement separately.

Results: The present position paper provides clinicians with statements and recommendations for clinical practice, regarding GAS and their effects on sexual wellbeing in trans individuals. These data, are limited and may not be sufficient to make evidence-based recommendations for every surgical option. Findings regarding sexual wellbeing following GAS were mainly positive. There was no data on sexual wellbeing following orchiectomy-only, vocal feminization surgery, facial feminization surgery or the removal of the female sexual organs. The choice for GAS is dependent on patient preference, anatomy and health status, and the surgeon’s skills. Trans individuals may benefit from studies focusing exclusively on the effects of GAS on sexual wellbeing.

Conclusion: The available evidence suggests positive results regarding sexual wellbeing following GAS. We advise more studies that underline the evidence regarding sexual wellbeing following GAS. This position statement may aid both clinicians and patients in decision-making process regarding the choice for GAS. Müde Özer, Sahaand Poor Toulabi, Alessandra D. Fisher, et al. ESSM Position Statement “Sexual Wellbeing After Gender Affirming Surgery”. Sex Med 2021;XX:XXXXXX.

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INTRODUCTION

Human sexual behaviour is a complex phenomenon, both for trans and non-trans or cis individuals, orchestrated by the interaction between biological, psychological and social factors. General studies on sexual wellbeing show that having a poor physical health or a chronic illness has a negative impact on sexual wellbeing, and that issues such as sex frequency, sexual pleasure and sexual satisfaction are strongly positively correlated with mental health. With trans individuals, having an increased susceptibility to poor mental health outcomes due to a lack of social acceptance and/or access to care, sexual health outcomes are thought to be equally affected. Furthermore, for trans individuals who might be undergoing changes in body composition and perception to align these with their gender identity, specific challenges may arise making sexuality a delicate subject to deal with in counselling. Additionally, data on the significance of sex steroids with respect to sexual functioning and satisfaction in cis individuals brings about the notion that Gender Affirming Medical Interventions (GAMI), such as hormone therapy and surgical interventions, might affect sexual functioning in trans individuals.

Studies on Sexual Wellbeing

Up to now, studies on sexual wellbeing of trans individuals are scarce or often based on a small population. Current literature mostly pays attention either at sexuality prior to GAMI or on the combined effect of hormonal and surgical interventions on sexual wellbeing.

Data on sexuality before Gender Affirming Surgery (GAS) from a multicentre prospective study in four European gender identity clinics (Amsterdam, Ghent, Hamburg, Florence, and Oslo) found no difference in frequency of the involvement of the genitalia and appraisal of genital sensation during sexual contact among individuals AMAB and AFAB (Assigned Female at Birth), prior to (GAS). In a small clinical study, about half of all trans individuals prior to genital surgeries, rated their sexual life as “poor or dissatisfied” or “very poor or very dissatisfied.” Receiving hormone treatment, experiencing negative feelings, and having a partner, however, were found to relate to better subjective perceptions of sexual quality of life. Other studies also report on the improved sexual functioning after GAS. The only available prospective study on this matter reported a significant decrease in sexual distress in trans individuals under hormone treatment. Despite the perceived detrimental effects of hormone treatment on sexual function - especially in individuals AMAB (Assigned Male at Birth) - sexual distress indeed is reduced after starting hormone treatment and sexual wellbeing might significantly improve by minimizing the incongruence between one’s body and gender identity.

Defining Sexual Health in Treatment Seeking Trans Individuals

Although sexual wellbeing is considered as an important aspect of quality of life, and recent studies show considerable improvement of quality of life after GAMI and GAS, little information is available on this subject in trans individual after GAS. This position paper uses ‘sexual wellbeing’ as the core concept of interest. The first written definition of sexual wellbeing originates from 2014 by Byers and Rehman, and Ozer et al modified this definition in the scope of treatment seeking trans individuals in 2021. Sexual wellbeing in this position statement is a combination of sexuality, enacted sexual script, sexual activities, sexual relations, sexual response cycle, genital function, sexual function, sexual pleasure, sexual satisfaction and quality of sex life.

Aim

The European Society for Sexual Medicine expressed the need for a position statement on sexual wellbeing after GAS, to supplement the existing World Professional Association for Transgender Health Standards of Care, which lacks data on the effects of GAMI specifically on sexuality and sexual wellbeing. This position statement is a continuation on the previous European Society for Sexual Medicine (ESSM) Position Statement on “hormonal management of adolescent and adult trans people”. The adjective ‘trans’ is used here in line with the previous ESSM Position Statement on “hormonal management of adolescent and adult trans people”, to refer to both binary and gender diverse individuals. This position statement therefore does not focus on differences in sexual health outcomes between binary-oriented or non-binary trans individuals, but is aimed at reviewing the available evidence on sexual wellbeing following GAS. The position statement wishes to provide clinicians who specialize in trans-related care with recommendations about the impact of various GAS on sexual wellbeing in treatment seeking trans individuals, on behalf of the ESSM.

METHODOLOGY

This position statement aimed at providing results on sexual wellbeing following various gender affirming surgeries, based on the results from a systematic literature review, divided into four main sections: Somatic and General Requirements before GAS, Sexual Wellbeing after GAS (studies who did not specify in genital or surgery when presenting results of sexual wellbeing), Feminizing GAS and Masculinizing GAS, each with the specific surgical procedures and their effects on sexual wellbeing.

The ESSM selected the authors based on their long-standing clinical experience and scientific involvement in specific areas of trans-related healthcare. A multidisciplinary approach was established by involvement of physicians from various specialties,
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including; endocrinology, oral and maxillofacial surgery, urology, plastic and gender surgery, sociology and sexology.

The search strategy was developed with aid from a research librarian of the Amsterdam University Medical Center. Relevant papers were sourced from the Medline, EMBASE, and Cochrane Library electronic databases from May 2017 until April 2020. Keywords and index terms, including applicable MeSH and Entree terms, were applied to each database. Search terms were generated under two broad headings - ‘gender incongruence’ and ‘sexual wellbeing’ —to create a wide scope on the subject, and were subsequently narrowed down to sexual wellbeing after GAS.

The following MeSH terms were applied to the Medline database: sex reassignment procedures; gender dysphoria; transgender persons; transsexualism; gender incongruence; gender affirming; trans women; trans men; sexual behaviour; coitus, courtship; masturbation; orgasm; dyspareunia; intercourse; copulation; penetration; lubrication; sexual; sensation; pain; arousal; desire; pleasure; satisfaction; dysfunction; wellbeing; relation; behaviour; activity and quality of sex life were applicable for MeSH terminology.

Literature was selected, discussed among the authors and combined with their multidisciplinary knowledge and clinical expertise to establish the statements. The overall quality of evidence of the literature was low, most recommendations of this position statement are therefore low in Level of Evidence. The statements that are strongly recommended are phrased as “should” and suggestions, phrased as “is advised to” or “may”. The statements were formed after consensus of all the authors.

Details on the literature search, eligibility and inclusion, data extraction and quality assessment are provided in Supplement 1.

An overview of the results on sexual wellbeing following various gender affirming surgeries can be accessed through Table 1-5-7.

SOMATIC AND GENERAL REQUIREMENTS BEFORE GAS

Statement #1 The gender surgeon should be aware of the effects of smoking and BMI when considering (genital) GAS. (Level I Grade A)

Statement #2 The gender surgeon should engage in shared decision making and counsel the patient on expectation management, including expected sexual outcomes, prior to GAS (Level II Grade D)

Statement #3 The gender surgeon is advised to collaborate with sexologists and pelvic floor physical therapists, trained on trans related health care, if available (Level IV Grade D)

Evidence

The surgeon and anaesthesiologist are tasked with assessing the general health status, perioperative risk, and contraindications as per the American Surgical Association physical status classification system, for individuals requesting surgery.44,45 Patients should be advised on smoking cessation and ideal weight for surgery, that is, a BMI between 18–30 kg/m², prior to genital GAS.46–48 The eventual decision for surgery in patients outside of the ideal BMI range falls upon the surgical and anaesthesiology team and should not be considered a hard Contra-Indication.

Hormone therapy may adversely affect fertility in both AFAB and AMAB individuals,49 while GAS may terminate potential for reproduction. Fertility preservation that is, cryopreservation of semen or oocytes, embryos or ovarian tissue- may aid in facilitating future parenting options.50

The choice between various surgical techniques for GAS is dependent on patient preference, patient anatomy and health status, and the surgeon’s skillset. Choices are increasingly being made through shared decision-making.51 The surgeon should inform the patient on the techniques available, their advantages and disadvantages, limitations with producing ‘ideal’ results and possible risks and complications.52–54 How the surgeon presents surgical options, risks and benefits is of great importance. The surgeon should preferably present photos of their previous work and provide data on their complication rate.52 Little has been published on postsurgical regret in regard to functional outcomes and complication rate. Lawrence, however, found that less complications and better functional results after vaginoplasty were associated with less postsurgical regret.55,56

SEXUAL WELLBEING AFTER GENDER AFFIRMING SURGERY

Gender Affirming Surgery (GAS) is an umbrella term for a variety of surgical procedures.57 It is important to note that trans individuals may or may not adhere to a standard linear progression from hormone treatment to surgical procedures.58 Sexual motivations may influence some individuals to prefer surgical interventions without prior hormone treatment, or opt out of some surgical procedures.59

The outcomes on sexual wellbeing following GAS are found in Table 1. Fourteen studies reported on general sexual wellbeing following GAS, without specifying what kind of procedure was performed or how the participants identified gender-wise, mainly focusing on sexual activities, erogenous sensation, orgasm and sexual satisfaction. Frequency of sexual activities increased after both hormonal and surgical treatment.26,60–62 Frequency of masturbation, however, was decreased in AMAB individuals and remained unchanged or increased in AFAB individuals.53,64 Every patient experienced postsurgical tactile erogenous, to some extent.53 Every AFAB individual and 85% of AMAB individuals were able to reach orgasm,32,33 either through masturbation or intercourse.26,60,61,63,65,66 Orgasm after GAS was experienced more frequently by both AMAB and AFAB individuals,66 less frequently by AMAB individuals,61 than by AFAB individuals.61

Most AMAB individuals were satisfied with GAS, reporting sexual satisfaction with the possibility of penetrative sex61,67 and
| Study                        | Design                  | Sample size | Age range | Sexual Topics                                                                 | Methods/Tools                        | Outcomes regarding Sexual Wellbeing                                                                 |
|-----------------------------|-------------------------|-------------|-----------|-------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------|
| Cohen-Kettenis et al 1997   | Follow-up study         | 4           | 4         | Sexual activity, intercourse, orgasm, relationship, masturbation, satisfaction with sex life | Semi-structured interview            | Sexually active: n = 13<br>Orgasm: 77%<br>No partner at time of interview or had never had one: 57%<br>Masturbation: 50% < 1/mo or never, 43% >1/mo; AMAB decrease in frequency, AFAB no change or increase Sexual satisfaction: 71% satisfied, 14% neutral view, 14% were dissatisfied |
| Jarolim et al 2000          | Outcome measure         | 4           | 4         | Lubrication, orgasm, clitoral activity                                         | Chart review                         | Vaginoplasty (n = 29): Sexual stimulation leads to production of urethral secretions which served as natural lubrication. Enabled coitus with orgasm<br>Metoidioplasty (n = 28): Preserved erotogenic clitoral activity |
| Johansson et al 2010        | Follow-up study         | 4           | 4         | Relationships, sexual orientation, sex life, sexual impairment                 | Semi-structured interview, self-developed questionnaire | Sexual impairment after GAS; 9% AMAB<br>Sex life: 70% better, 25% unchanged, 5% worsened<br>Partner relations: 62% better, 30% unchanged, 8% worsened |
| Kuhn et al 2011             | Follow-up study         | 4           | 4         | Sexual activity: satisfaction, frequency                                        | Sheffield prolapse questionnaire     | Stable relationship: 77%<br>75% considered sex life to interfere to some degree with enjoyment of life (better and/or worse)<br>Most were sexually satisfied and had sex on a regular basis |
| Lief et al 1993             | Outcome measure         | 4           | 4         | Frequency of sex (not restricted to coitus, orgasmic capacity, reasons for anorgasmia, sexual satisfaction, sexual preference) | Self-developed questionnaire          | AMAB<br>Orgasm: 10 anorgasmic, 10/14 Orgasmic before, 8 lost capacity, 4/14 anorgasmic before, 2 gained capacity<br>Reasons for anorgasmia: dissatisfied with vaginal depth or cosmesis<br>Frequency of sex: 75% increase<br>Sexual satisfaction: 9/14 increase in satisfaction |
| Lobato et al 2006           | Follow-up study         | 4           | 4         | Satisfaction with sexual experience, partnerships, and relationship with family members, sexually active, frequency of sex, pleasurability of sex. | Self-developed questionnaire          | Sexually active: 95%<br>More frequent sex: 64.7%<br>Pleasurability of sex: 83.3%<br>Partnership<br>Initiating and maintaining relationship easier post SRS: 64.7%<br>Relationship pre-op: 52.6%<br>Relationship post-op: 73.7%<br>Satisfaction with sexual experience poor or very poor post-op: 11.2%<br>Improvement of sexual experience post-op: 83.3% |

(continued)
| Study                        | Design                      | Sample size | Age range | Sexual Topics                                           | Methods/Tools                              | Outcomes regarding Sexual Wellbeing |
|-----------------------------|-----------------------------|-------------|-----------|--------------------------------------------------------|--------------------------------------------|-------------------------------------|
| Lothstein et al 1980        | Group comparison / Follow-up study | 4           | 21–42     | Sexual adjustment and functioning, improvement sex life, sexual activity, number of sexual partners, orgasm, sexual behaviour, partnering | Self-developed questionnaire              | AMAB                                                                 |
|                             |                             |            |           |                                                       |                                            | Improvement sex life 67%               |
|                             |                             |            |           |                                                       |                                            | Sexual activity & number of sexual partners: no increase |
|                             |                             |            |           |                                                       |                                            | Orgasm: 2 ejaculatory sensations       |
|                             |                             |            |           |                                                       |                                            | Sexual behaviour: more flexible and spontaneous (engaging more frequently in oral, anal, and vaginal intercourse) |
|                             |                             |            |           |                                                       |                                            | Partnering: tended to seek out new partners, 64% no relationship |
|                             |                             |            |           |                                                       |                                            | AFAB                                                                 |
|                             |                             |            |           |                                                       |                                            | Improvement sex life 67%               |
|                             |                             |            |           |                                                       |                                            | Sexual activity & number of sexual partners: no increase |
|                             |                             |            |           |                                                       |                                            | Partnering: kept the same partners, 64% no relationship |
| Rakic et al 1996            | Follow-up study             | 4           | 19–47     | Orgasm, number of sex partners, sexual activity, satisfaction with relationships | Self-developed questionnaire: 'Adjustment to Sex Reassignment Surgery' | Relationship satisfaction: 87%          |
|                             |                             |            |           |                                                       |                                            | Sexual partner: AMAB 23%, AFAB 80%     |
|                             |                             |            |           |                                                       |                                            | Several sexual partners: AMAB 50%      |
|                             |                             |            |           |                                                       |                                            | Orgasm: 50%                           |
| Selvaggi et al 2007         | Outcome measure             | 4           | No data   | Orgasm, sensitivity                                    | Interview and physical examination: Semmes-Weinstein, vibration tests (biothesiometer) | The reconstructed genitalia obtain tactile and erogenous sensitivity |
|                             |                             |            |           |                                                       |                                            | Orgasm: AMAB 85%, AFAB 100%            |
| Smith et al 2001            | Group comparison / Follow-up study | 4           | 15–19     | Orgasm, relationship status, sexual orientation, intercourse, sexual functioning | Self-developed questionnaire, Utrecht Gender Dysphoria Scale (UGS), Body Image Scale (BIS) | Sexual partner: 10 patients            |
|                             |                             |            |           |                                                       |                                            | Satisfaction with sex life: 1 FM was dissatisfied (could not have intercourse with a “normal” penis) |
|                             |                             |            |           |                                                       |                                            | Several AFAB: difficult to live without a penis |
|                             |                             |            |           |                                                       |                                            | Know their potential sexual partner well |
|                             |                             |            |           |                                                       |                                            | Masturbation: AMAB → decrease in masturbation frequency, AFAB → increase or no change. |
|                             |                             |            |           |                                                       |                                            | Orgasm: 69%                           |
|                             |                             |            |           |                                                       |                                            | Sexual orientation: stayed compatible  |
| Sorensen 1981               | Outcome measure             | 4           | 30–60     | Intercourse, sexual satisfaction, masturbation, orgasm, sensitivity, ability to perform intercourse, importance of sexual activity, pain | Structured interview                      | Sexual partner: all patients            |
|                             |                             |            |           |                                                       |                                            | Sexual satisfaction: only from clitoris (all); |
|                             |                             |            |           |                                                       |                                            | 5 satisfactory, 3 unsatisfactory       |
|                             |                             |            |           |                                                       |                                            | Masturbation: all, >2 a wk              |
|                             |                             |            |           |                                                       |                                            | Orgasm: all                           |
|                             |                             |            |           |                                                       |                                            | Importance of sexual activity: essential in a life with a partner to all |
|                             |                             |            |           |                                                       |                                            | Pair during intercourse in the 2 patients with phalloplasty from rib |

(continued)
| Study                                                | Design                  | Sample size | Age range | Sexual Topics                                                                 | Methods/Tools                                                                 | Outcomes regarding Sexual Wellbeing                                                                 |
|------------------------------------------------------|-------------------------|-------------|-----------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Tsoi et al 1993                                      | Outcome measure         | 4           | 20–36     | Satisfaction with: sexual activities, organ functioning, sex status, sex organ | Semi-structured interview, self-developed questionnaire                      | Good or satisfactory sexual activity: MtF 64% vs FtM 61% Good or satisfactory sex organ function: MtF 91% vs FtM 39% Good or satisfactory sex status: MtF 95% vs FtM 81% Good or satisfactory sex organ: MtF 91% vs FtM 39% |
| van de Grift et al 2017 A longitudinal study         | Follow-up study         | 4           | Mean 40.1 y | Sexual activity (type of activity), sexual preference and change in preference, partnering, sexual satisfaction | Self-developed questionnaire, chart review, Body Image Scale (BIS)           | Female partner 63.2% Male partner 10.5% Single 26.3% Sexual function: metoidioplasty higher sexual satisfaction Postop sexual activity: more masturbation and sexual activity, genitals more freq used (31% vs 78%) More pleasure, confidence, passive role Changed sexual orientation (“exclusively to men” to “primarily to women”). Grade for sex life: 5.5 of 10 (SD 2.6) “impossibility to penetrate/no erection prosthesis”, “not sexually active”, “penile size/sensation” and “partner issues” |
| Wierckx et al 2011 Quality of life and               | Follow-up study         | 4           | 22–54     | Relationship status, sexual preference, sexual activities (frequency, type of activity, pain), sexual wellbeing, masturbation, sexual satisfaction, orgasm, arousal | Self-developed questionnaire                                                  | Treatment phase differed within the group Relationship 63.3% Attracted to females 85.7% Partner: heterosexual woman 77.4% Frequency of sex: Never 22.2% 1-2/month 48.1% Several times a week 29.6% Sex satisfaction: (very satisfied) 64.2% Erection prosthesis (n = 32) Frequency of masturbation: Less than monthly- daily Aroused easily: majority Orgasm through masturbation: majority Orgasm by intercourse: majority Change in orgasmic feeling: 58.3% |
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being partnered. Initiating and maintaining intimate relationships became easier postoperatively. Limited sensitivity and absence of erectile function after phalloplasty decreased sexual satisfaction in AFAB individuals. Phalloplasty was not found to be a critical factor in reaching orgasm or sexual satisfaction, difficulties in engaging in new sexual contacts, however, may have been a factor preoperatively. The strongest motivation to pursue penile surgery was confirmation of one’s identity. Post-surgical aesthetics and functionality were satisfactory, including the ability to void while standing. Disappointment following GAS resulted because of a decrease in sex drive, not being partnered or having non-functional genitalia.

Advice regarding postsurgical care and follow-up were provided by two studies. Kuhn et al concluded that pelvic floor symptoms involving the bladder, bowel, and sexual function may occur in AMAB individuals. Lothstein et al advised counselling and psychotherapy prior to surgery and continued follow-up after completing GAS to improve sexual wellbeing.

SURGICAL PROCEDURES FOR FEMINIZING GAS

This section addresses different types of feminizing GAS, with their respective results regarding sexual wellbeing.

Orchiectomy-Only

Statement #4 The gender surgeon is advised to consider orchiectomy-only as a viable surgical option for trans individuals AMAB (Level IV Grade D)

Statement #5 The gender surgeon should counsel the trans individual AMAB on the expected effects on sexual wellbeing prior to orchiectomy (Level II Grade A)

Evidence. Indications include patient preference- in not opting for vaginoplasty- and failing at meeting somatic requirements for anti-androgen use or vaginoplasty (see: somatic requirements before GAS). Orchiectomy does not provide surgical consequences for future vaginoplasty, therefore can also be performed while waiting for a future vaginoplasty. Testosterone levels below 20 ng/dL (0.7 nmol/L) have been reported in patients following orchiectomy, patients should be counselled on possible adverse effects of low testosterone levels on sexual wellbeing.

Sexual Wellbeing After Orchiectomy. We found no studies on sexual wellbeing in trans individuals AMAB after orchiectomy-only.

Vaginoplasty

Statement #6 The gender surgeon should provide trans individuals AMAB the penile-inversion technique as the vaginoplasty of choice (Level IV Grade C)

Evidence. Vaginoplasty-comprised of vulvoplasty, penectomy, orchiectomy and vaginal canal creation-aims at obtaining an aesthetically pleasing and functional genital complex, vulva and neo-vagina, with adequate depth. The vaginal canal is created between the rectum and bladder, and lined with penile skin-optionally modified with skin grafts, urethral mucosa or scrotal flaps-skin grafts-only, bowel segments or peritoneum. The clitoris is formed by the dorsocentral part of the glans penis, the clitoral hood is formed either from the prepuce or with penile skin. Urethral grafts may aid in vaginal lubrication and sensitivity. The penile-inversion vaginoplasty is currently considered the gold standard. Studies show that penile-inversion vaginoplasty is associated with satisfaction with aesthetics and function. (See below 5.3.2).

Indications for vaginoplasty (or zero-depth vaginoplasty) include patient preference or extensive morbidity, for example, a history of rectal fistula. Counselling is strongly recommended to minimize the risk of future regret.

Sexologists and pelvic floor physical therapists may counsel patients on dilation and aid in reducing voiding difficulties, which are not related to meatal stenosis. Consultation should preferably be commenced prior to surgery, and continued postoperatively. The sexologist may address issues regarding changing sexual function, for example; in, phantom pains, sexual stimulation and arousal. Possible complications of vaginoplasty are perforations and fistulae, haemorrhage and possible future secondary corrections. Secondary corrections are dependent on patient preference and may include resection of residual spongiosum, labiaplasty, clitoral repositioning, correction of the meatus or introitus and vaginal depth augmentation.

Sexual Wellbeing After Vaginoplasty. Sixty-one studies reported outcomes on sexual wellbeing following vaginoplasty, available in Table 2. Postoperative genital sensitivity- defined as clitoral sensation, orgasmic sensation and genital sensation-was conserved in almost every
| Study | Design | LoE | Sample size | Age range | Sexual topics | Methods/Tools | Outcomes regarding Sexual Wellbeing |
|-------|--------|-----|-------------|-----------|---------------|---------------|-------------------------------------|
| Amend et al 2013, Surgical reconstruction<sup>[87]</sup> | Outcome measures | 3 | 13 AMAB | 20–54 | Intercourse, satisfaction, neo-clitoral sensation, vaginal depth, orgasm | Self-developed structured interview | 23 (96%) were satisfied with neo-clitoral sensitivity, which led to orgasm. Neo-clitoral sensation was excellent in 18, good in 5, and unsatisfactory in 1. Eight (33 %) had engaged in intercourse, without the need for lubrication. None experienced intravaginal hair growth or loss of vaginal capacity. |
| Blanchard et al 1983, Vaginoplasty outcome<sup>[88]</sup> | Outcome measures | 3 | 22 AMAB | Orgasm, intercourse, self-reported depth adequacy, pain/discomfort during sex, discomfort after sex, frequency of sex, sexual orientation | Structured interview, pelvic exam | 19 (86.4%) had intercourse at least once; 8 experienced no pain, 2 did always, 5 did initially or after a period of sexual inactivity, 4 did slightly. 3 experienced discomforts after sex |
| Bouman et al 1988, Sex reassignment<sup>[89]</sup> | Outcome measures | 4 | 76 AMAB | No data | Sexual intercourse, satisfaction during sex, neo-vaginal dimensions, | Chart review | 3 had complaints due to small vaginal diameter, one was unable to perform receptive vaginal sex. 30 had intercourse with men, 11 with men, 15 had not. |
| Bouman et al 2016, Patient-Reported<sup>[90]</sup> | Follow-up study | 4 | 31 AMAB | 18–45 | Vaginal intercourse, neo-vaginal dimensions, sexual arousal, sexual feelings, orgasm, desire, lubrication, satisfaction | Female Sexual Function Index, Female Genital Self-Image Scale, Short Questionnaire for Self-Evaluation of Vaginoplasty, Amsterdam Hyperactive Pelvic Floor Scale—Women | 21 were sexually active, 16 had sex more than once. Every participant experienced sexual arousal. 84 % could reach orgasm, 4% could not, and 12% had not tried. |
| Brota et al 2005, Psychophysiological and<sup>[91]</sup> | Prospective cross-sectional study | 3 | 15 AMAB | 21–65 | Thoughts/desire, Frequency of sexual activity, receptivity/initiation, relationship satisfaction, problems affecting sexual function, sexual arousal, non-genital physical arousal, genital arousal, pleasure from direct genital stimulation, orgasm (eg, clitoral stimulation, intercourse, vibrator use, fantasy), satisfaction with organic function, dissatisfaction or distress, effects of erotic stimuli, objective arousal using a vaginal pulse amplitude | Self-developed questionnaire during Vaginal pulse amplitude (VPA), Brief Index of Sexual Functioning for Women (BISF-W); Detailed Assessment of Sexual Arousal (DASA); | 4 were sexually active, 6 were able to achieve orgasm, 10 were satisfied with their organic function, 3 (20%) dissatisfied or distressed. |
| Buncamper et al 2015, Aesthetic and<sup>[92]</sup> | Retrospective cross-sectional survey | 4 | 49 AMAB | 29–53 | Sexually activity, desire, arousal, lubrication, orgasm, satisfaction, comfort, sexual intercourse, neo-vaginal dimensions, sexual feelings | Female Sexual Function Index (FSFI), Amsterdam Hyperactive Pelvic Floor Scale—Women (AHPSF-W), Female Genital Self-Imaging Scale, short questionnaire for self-evaluation of vaginoplasty | 36 were sexually active, 27 had attempted intercourse (3 of those tried but were unable). 83.7% had reached orgasm, 10.2% had not, 6.1% had not tried. Orgasmic sensation was equal in 22.4%, less in 28.6%, more in 56.9% and was missing in 2%. compared to prior to vaginoplasty. Provoked vulvodynia was scored with a mean of 1.33 (SD 0.7; 5-point scale from never - very often). Self-reported sexual arousal was present in 64, |
| Buncamper et al 2017, Penile Inversion<sup>[93]</sup> | Group comparison | 4 | 100 AMAB | 18–68 | Sexually activity, desire, arousal, lubrication, orgasm, satisfaction, comfort, sexual intercourse, neo-vaginal dimensions, sexual feelings | Female Sexual Function Index (FSFI), Female Genital Self-Imaging Scale | 42 had been sexually active in the last 4 weeks. Median score for vaginal functionality: 8 (range 2–10); 1–10 scale, 10 being better; n = 45. |
| Cardoso da Silva, et al 2016, WHOQOL-Y<sup>[94]</sup> | Follow-up study | 4 | 47 AMAB | 16–54 | Marital status, sexual activity | WHOQOL-Y | 5 were in a stable relationship, 42 were not. |
| Cocci et al 2019, Male-to-female<sup>[95]</sup> | Outcome measures | 4 | 94 AMAB | M 29.5 y | Intercourse, erogenous sensitivity | Not specified | 81 (86.6%) had intercourse. Erogenous sensitivity during dilatation, intercourse or masturbation was present in 78 (82.9%). |
| Colley & et al 2002, Patient satisfaction<sup>[96]</sup> | Outcome measures | 4 | 57 AMAB | 21–35 | Orgasm, sexual satisfaction | Self-developed questionnaire | 34 patients were more sexually satisfied post-surgery; 17 patients had no change; 4 patients were less satisfied. |
| di Summa et al 2019, Colic-based<sup>[97]</sup> | Outcome measures | 4 | 43 AMAB | 22–69 | Satisfaction with the appearance/dimensions of the genitals, satisfaction with genital function (ing), orgasm, clitoral, vaginal or both, difficulties achieving orgasm, dyspareunia | Retrospective chart review, custom questionnaire | Of n = 28 10 (35.7%) was very satisfied with sexual functioning, 14 (50%) satisfied, 4 (14.3%) unsatisfied, none very unsatisfied. 25 (89.3%) was satisfied or very satisfied with vulvar appearance, 3 (10.7%) unsatisfied, none very unsatisfied. |

(continued)
| Study | Design | LoE | Sample size | Age range | Sexual topics | Methods/Tools | Outcomes regarding Sexual Wellbeing |
|-------|--------|-----|-------------|-----------|---------------|--------------|-------------------------------------|
| Djordjevic et al 2011, Rectosigmoid vaginoplasty | Outcome measures | 4 | 27 AMAB | 18−57 | Vaginal dimensions, mucous production, sexual satisfaction, sexual activity, time till first intercourse, pain | FSFI, interview | Sexual function was rated satisfactory in 21, 6 were unsatisfied. 73 individuals of the entire cohort were sexually active, separate results not provided. 27 experienced temporary mild bleeding and dyspareunia. |
| Eldh et al, 1993, Construction of | Outcome measures | 4 | 20 AMAB | No data | Orgasm, sexual function, clitoral sensation, intercourse | Chart review | 20 could reach orgasm through masturbation or intercourse. 19 (95%) were pleased with their neo-clitoral sensation. 1 (5%) had no sensitivity. |
| Freundt et al 1993, A modified | Outcome measures | 4 | 23 AMAB | 16−52 | Sexual relations, vaginal function, sexual satisfaction, intercourse | Structured interview, pelvic examination | 5 had regular intercourse, 4 women occasionally, 1 did not. Sexual satisfaction was rated good by 2, satisfactory by 2, doubtful by 5, and unsatisfactory by 1. 2 were satisfied with sex life (20%), 4 were neutral, and 4 dissatisfied. |
| Giraldo et al. 2004, Corona glans | Outcome measures | 4 | 16 AMAB | 20−41 | Orgasm | Chart review | 16 were able to achieve orgasm. |
| Goddard et al, 2007, Feminizing genitoplasty | Outcome measures | 4 | 233 AFAB, 70 (follow-up) | 19−76 | Clitoral sensation, sexual arousal, vaginal dimensions, intercourse, orgasm | Telephone questionnaire | Of 70 with follow-up, 64 had a neo-clitoris and 62 a vaginal canal. 11 had regular intercourse, 31 could reach clitoral orgasm. Of 183 with neo-clitoral formation: neo-clitoris was sensitive in 158, insensitive in 5, NA in 20. 4 experienced painful or uncomfortable clitoral sensations. |
| Hess et al 2016, Modified preparation | Follow-up study | 4 | 96 AMAB | 19−62 | Neo-clitoral sensation, orgasm | Semi-quantitative grading of neo-clitoral sensitivity | Assessment of sensitivity by brushing over the clitoris with a brush, and pallesthesia by placing a 64 Hz tuning fork on the clitoris. A semi quantitative scoring system was formed by accumulating both: grade 0, no tactile sensation and complete pallesthesia; grade 1, reduced pallesthesia and no tactile sensation; grade 2, intact pallesthesia and reduced tactile sensation; grade 3, complete pallesthesia and tactile sensation. |
| Hess et al 2018, Sexuality after | Follow-up study | 4 | 119 AMAB | 16−68 | Sexual orientation, intercourse, frequency of sex, orgasm, orgasm frequency and sensation, satisfaction with clitoral sensation, satisfaction with the appearance/dimensions of the genitals, satisfaction with sex life, pleasurable sensation of sex, sexual arousal | Unspecified questionnaire | 33.7% were heterosexual, 37.6% lesbian, and 22.8% bisexual. 67 (56.3%) did not have regular intercourse. Of those who had sexual intercourse, 55.8% rated orgasm more intense following GAS, 20.8% who felt no difference. 73.9% were satisfied with neo-clitoral sensitivity, and 67.1% with vaginal depth. |
| Imbimbo et al 2009, A report from | Outcome measures | 4 | 163 AMAB | 21−59 | Sexual activity, type of sexual activity, orgasm, masturbation, Satisfaction with sexual life, vaginal dimensions | Telephone questionnaire | Of n = 88: sexual activity was always pleasurable for 31 (35.2%), sometimes pleasurable for 44 (50.0%), and never pleasurable for 13 (14.8%). |
| Jarolim et al 2009, Gender reassignment | Outcome measures | 4 | 129 AMAB | 18−54 | Neo-clitoral erogenous sensation, orgasm, lubrication | Chart review | Of n = 98: 92 (94%) had erogenous sensitivity of the neo-clitoris had. 64 (65%) reached orgasm 3 mos., some with urethral secretions, which provided lubrication. |
| Kanhai et al 2016, Sensate vagina | Outcome measures | 4 | 50 AMAB | 19−65 | Erogenous sensation in both clitoral pedicles | Chart review | 46 (92%) experienced erogenous sensitivity and 4 (8%) sexual sensations in the clitoris. 44 (88%) experienced erogenous sensitivity and 31 (62%) sexual sensitivity of the sensate pedicled spot. |
| Jiang et al 2018, Does depth matter | Outcome measures | 4 | 30 AMAB | 28−74 | Relationship status, orgasm, sexual activity, | Case-series | Of n = 16: 4 (29%) could achieve orgasm, 3 (21%) could not, 7 (50%) were not sexually active. |

(continued)
| Study                                      | Design          | LoE  | Sample size | Age range | Sexual topics                                                                 | Methods/Tools         | Outcomes regarding Sexual Wellbeing                                                                                                                                 |
|-------------------------------------------|-----------------|------|-------------|-----------|--------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Karim et al 1991, The importance of        | Outcome measures| 4    | 13 AMAB     | 23–51     | Swelling and narrowing of vagina during sexual arousal                         | Chart review          | Of n = 30: 17 (57%) were married or in a stable relationship, 13 (43%) were not. 10 experienced vaginal swelling and narrowing during sexual arousal, none did after removal of the corpora spongiosa and cavernosa, none did after removal of the tissue. |
| Kim et al 2003, Long-term results          | Outcome measures| 4    | 28 AMAB     | 22–50     | Vaginal dimensions, sexual intercourse, lubricant use, pain during intercourse, orgasm, vaginal bleeding during intercourse | Cross-sectional study | 22 (78.6%) had intercourse; 1 experienced abdominal pain and 2 vaginal bleeding during intercourse, and 19 could reach orgasm during intercourse.     |
| Kim et al 2017, Is Rectosigmoid           | Outcome measures| 4    | 44 AMAB     | 23–47     | Sexual intercourse, orgasm                                                     | Chart review          | 79 (94%) had intercourse; 72 experienced orgasms, 2 had mild intermittent abdominal pain, 6 long-lasting abdominal pain, and 6 a small amount of vaginal bleeding after intercourse. |
| Krege et al 2001, Male-to-female          | Follow-up study  | 4    | 66 AMAB     | 20–57     | Sexual intercourse, problems during intercourse, recurrent bleeding after intercourse, clitoral orgasm, vaginal dimensions | Self-developed questionnaire | n = 31 with follow-up: 27 (87%) could reach clitoral orgasm, 18 (58%) had intercourse, 8 (25.6%) had problems during intercourse (1 swelling of remnants of the corpus spongiosum; 1 problem intravaginal sutures line; 2 pains during intercourse; 1 recurrent bleeding after). |
| Lawrence et al 2003, Factors associated   | Follow-up study  | 4    | 232 AMAB    | 19–72     | Vaginal dimensions, vaginal lubrication, vaginal discharge, sensation to touch at the vaginal opening, sensation to touch deep in the vagina, vaginal pain with penetration, vaginal erotic sensation, clitoral touch sensation, clitoral erotic sensation, clitoral pain, sexual attraction, sexual experience, arousal | Self-developed questionnaire | The number of surgical complications was negatively correlated, and functional results were positively correlated with the absence of regret regarding vaginoplasty. The amount of psychotherapy and the number of complications were negatively, and functional results were positively correlated with happiness with the results of vaginoplasty. |
| Lawrence et al 2005, Sexuality before     | Follow-up study  | 4    | 232 AMAB    | 19–72     | Sexual orientation, number of sexual partners, frequency of sexual activity, stable partnered relationships, sexual arousal to cross-dressing or cross-gender fantasy, frequency and characteristics of orgasm after GAS | Self-developed questionnaire | Of n = 226: 76% had postsurgical sexual experiences (28% had mostly female partners, 38% mostly male, 25% bisexual). Of n = 226: 21% (95%) were sexually active prior to surgery, 12 (5.3%) were not. 72% had mostly female partners, 8% mostly male, 15% bisexual. Of n = 227, 21% (95.6%) had masturbated: 62 (36%) almost always orgasm during masturbation, 27 (12%) > half the time, 33 (15%) did < half the time, 34 (15%) rarely, 41 (18%) never, and 10 (4%) NA. Of n = 217: orgasm prior to and after surgery was almost identical for 4 (2%), very similar for 19 (9%), somewhat similar for 53 (24%), slightly similar for 52 (24%), entirely different for 57 (26%), NA for 32 (15%). Of n = 217: orgasm after surgery was much more pleasurable for 65 (30%), somewhat more pleasurable for 45 (21%), about as pleasurable for 35 (16%), somewhat less pleasurable for 35 (16%), much less pleasurable for 8 (2%), NA for 30 (14%). Of n = 217: 52 (24%) almost always released fluids during orgasm, 22 did > half of the time for 22 (10%), 17 (8%) did < half of the time, 29 (13%) did rarely, 40 (18%) never, and 57 (26%) NA. |
| Study | Design | LoE | Sample size | Age range | Sexual topics | Methods/Tools | Outcomes regarding Sexual Wellbeing |
|-------|--------|-----|-------------|-----------|---------------|---------------|--------------------------------------|
| Lawrence et al 2006, Patient-reported complications | Follow-up study | 4 | 232 AMAB | 19–72 | Vaginal dimensions, vaginal lubrication, vaginal discharge, sensation to touch at the vaginal opening, sensation to touch deep in the vagina, vaginal pain with penetration, vaginal erotic sensation, clitoral touch sensation, clitoral erotic sensation, clitoral pain, sexual attraction, sexual experience, arousal, frequency of orgasm | Self-developed questionnaire | Mean rating on 0–10 scale, 10 being better, were: 7.8 (SD 2.4) for overall happiness with genital sexual function after GAS; 4.6 (SD 2.8) for vaginal lubrication; 7.1 (SD 2.4) for mean rating for pain with vaginal penetration. |

Frequency of achieving orgasm was significantly associated with overall happiness with sexual function. Individuals who could never orgasm were significantly less happy with their sexual function than others.

LeBreton et al 2017, Genital Sensory | Outcome measures | 3 | 28 AMAB | 25–60 | Genital sensitivity, overall satisfaction (patient’s satisfaction with the appearance of their genitals, sexual functioning, and clitoral sensitivity), frequency of sexual activities (masturbation, mutual masturbation, vaginal intercourse, anal stimulation, anal intercourse, and oro-genital stimulation) orgasm frequency with each of these activities. | Genital sensitivity; Semmes-Weinstein monofilaments (light touch), vulvalgesiometer (pressure), vibralgic 4 device (vibration), questionnaire developed by Lothstein and Shinar, self-developed questionnaire, Derogatis Fantasy Scale. | Subjective clitoral sensation was not statistically significantly correlated with sexual satisfaction. |

Detection thresholds for light touch showed the highest sensitivity on the neck, followed by the anus, abdomen, clitoris, labia minora and then the vaginal opening.

Detection thresholds for pressure showed the highest sensitivity on the neck, followed by the clitoris, anus, abdomen, labia minora and the vaginal opening.

Detection thresholds for vibration showed the highest sensitivity on the clitoris; followed by the labia minora, the neck; the abdomen; and the vaginal opening and anus.

Frequencies of sexual activities ranged from: 0 = N.A.; 1 = < 1/yr; 2 = < 1/mo; 3 = 1/mo; 4 = 2/mo; 5 = 1/wk; 6 = several times/week; 7 = daily; 8 = >daily.

20 (80%) had experienced orgasm. Mean frequencies of achieving orgasm prior to and after having GAS, respectively, were 0.90 (SD 1.38) and 0.56 (SD 1.36) for masturbation, 0.50 (SD 1.47) and -0.24 (SD 1.27) for mutual masturbation, 1.00 (SD 1.29) and -0.12 (SD 1.09) for vaginal intercourse (penetrative and receptive, respectively), -1.18 (SD 1.29) and -0.16 (SD 1.09) for receptive oral sex, -0.14 (SD 1.27) and -0.36 (SD 1.15) for receptive anal sex, and -0.05 (SD 1.47) and 0.08 (SD 1.04).

Prior to GAS: mean frequency of receptive anal sex was 3.20 (SD 2.63), 2.60 (SD 2.71) for insertive vaginal sex, 2.32 (SD 2.75) for receptive oral sex, and 3.20 (SD 2.48) for receptive anal stimulation.

Following GAS: mean frequency of receptive vaginal sex was 3.44 (SD 2.69), 2.04 (SD 2.56) for receptive anal sex, 3.48 (SD 2.45) for receptive oral sex, and 2.48 (SD 2.69) for receptive anal stimulation.

The difference between pre- and postoperative frequency of receptive oral sex was statistically significant.

(continued)
| Study | Design | LoE | Sample size | Age range | Sexual topics | Methods/Tools | Outcomes regarding Sexual Wellbeing |
|-------|--------|-----|--------------|-----------|---------------|---------------|-----------------------------------|
| Lindemalm et al 1986, Long-term<sup>10</sup> | Evaluation of GAS | 4 | 13 AMAB | 27–62 | Sexual adjustment, sexual function, libido, sexual activity, orgasm, partner relations | Semi structured interview, chart review | Of n = 12: 11 (92%) were sexually active prior to GAS, 1 (8%) was not. Following GAS, 10 (77%) were sexually active. Orgasm prior to GAS: 9 (69.2%) could, 1 (7.7%) could not, unclear for 3 (23.1%). Orgasm after GAS: 6 (46.2%) could (2 with ejaculation), 6 (46.2%) could not, unclear for 1 (7.6%). Strength of libido prior to GAS was low for 5, high for 6, NA for 2. Following GAS: low for 7 (of which previously high; 2 NA), moderate for 1 (previously low), high for 5. |
| Lindemalm et al 1987, Prognostic factors<sup>11</sup> | Evaluation of GAS | 4 | 13 AMAB | 27–62 | Sexual adjustment, libido, sexual activity with partner, number of partners, orgasm, object choice, partner relations | Retrospective rating of interview | The following outcomes prior to GAS were associated with fair or good overall sexual adjustment after GAS: high sexual activity with a partner, strong libido, intercourse with women, and bisexual experience. High frequency of masturbation was not associated with good adjustment. |
| Manrique et al 2018, Gender-Confirmation | Evaluation of rectosigmoid vaginoplasty | 4 | 15 AMAB | 18–32 | Sexual function | Retrospective chart review, Female Sexual Function Index (FSFI), Female Genital Self-Image Scale (FGSIS) | One (5.7%) had by narrowing at the introitus, which required intervention. The mean Female Sexual Function Index score was 28.6 (range, 24–31). Every individual achieved normal sexual function (FSFI ≥ 26) |
| Mate-Kole et al 1990, A controlled study<sup>12</sup> | Outcome measures | 4 | 40 AMAB (20 postop, 20 preop) | 21–53 | Sexual interest, sexual relationships | Chart review | Sexual interest during follow-up of 2 years for n = 20 following GAS was unchanged for 4, 15 were more active, none were less active. Sexual interest for n = 20 awaiting surgery remained unchanged for 17, 0 were more active, 3 were less active. |
| Morrison et al 2015, Long-Term Outcomes<sup>13</sup> | Outcome measures | 4 | 83 AMAB | 36–78 | Dyspareunia, need for lubricant, mucorrhea, orgasmic capacity, sexual function | Phone interview; chart review | Of n = 44: 43 (98%) were able to orgasm. Of n = 34: 13 (38%) experienced dyspareunia. Of n = 29: 7 (26%) needed lubrication during intercourse. Average rating for satisfaction for n = 24 was 4.24 (1–5 scale). |
| Mukai et al 2017, Vaginoplasty with<sup>14</sup> | Outcome measures | 4 | 15 AMAB | M 34.2 (SD 4.0) | Intercourse, pain, vaginal dimensions | Chart review | 14 (93.3%) had intercourse. 1 (6.7%) experienced discomfort during intercourse, because of neovaginal depth of 5–6 cm. |
| Papadopoulos et al 2020, Psychological Pathologies<sup>25</sup> | Follow-up study | 4 | 47 AMAB | 18–57 | Improvement of sex life, sexual orientation, change in sexual preference | Custom questionnaire | 29 (63.7%) experienced an improvement of sex life following GAS. All reported sex: 12 (25.5%) were heterosexual, 22 (46.9%) homosexual, 11 (23.4%) bisexual and 2 (4.3%) otherwise. Following surgery n = 46, 15 (32.6%) were heterosexual, 10 (21.7%) were homosexual gay, 21 (45.7%) were bisexual. |
| Papadopoulos et al 2017, Combined vaginoplasty<sup>26</sup> | Follow-up study | 4 | 40 AMAB | M 38.6 (SD 12.6) | Vulvar sensitivity, vaginal dimensions | Chart review and follow-up | Most women reported normal labial and vaginal sensitivity, and strong clitoral sensitivity. |
| Perovic et al 2000, Vaginoplasty in<sup>27</sup> | Outcome measures | 4 | 89 AMAB | 18–56 | Orgasm, vaginal sensitivity, vaginal moisture, intercourse, vaginal dimensions | Interview | 73 (82%) had orgasm, 69 (79%) were having intercourse. Presence of vaginal moisture was satisfactory for 71 (80%) and unsatisfactory for 16 (19%). |
| Raigosa et al 2015, Male-to-Female<sup>18</sup> | Outcome measures | 4 | 60 AMAB | YH–50 | Frequency and quality of intercourse, orgasm, vaginal dimensions, clitoral sensation | Interview (direct questioning during follow-up) | 52 (86%) had regular intercourse. Clitoral sensibility was acceptable and led to orgasm for all participants. |
| Reed et al 2015, Non-grafted Vaginal<sup>19</sup> | Outcome measures | 4 | 18 AMAB | No data | Vaginal dimensions, sexual function | FSFI and clinical examination | Of n = 10: FSFI domain scores (lubrication 3.7; desire 3.5; arousal 4.0; orgasm 3.9; satisfaction 3.6; pain 4.7) were in mid-range. Average total score was 23.4 (22–36). |
| Rehman et al 1999, The reported sex<sup>20</sup> | Outcome measures | 4 | 28 AMAB | 18–44 | QoL, sexual orientation, sexual activity, type of sexual contact (oral, anal, vaginal, other), sexual satisfaction, orgasm (ability and importance), lubricant use, reasoning for sexual inactivity | Interview, self-developed questionnaire | 15 (53.6%) had intercourse, all had some degree of pain during sex and all were using some form of lubricant. 7 (25%) had masturbated. 14 (50%) reported satisfaction from sexual activities and experienced orgasm most of the time, quality and intensity of orgasms were better |

<sup>10</sup> Lindemalm et al 1986, Evaluation of GAS
<sup>11</sup> Lindemalm et al 1987, Prognostic factors
<sup>12</sup> Manrique et al 2018, Gender-Confirmation
<sup>13</sup> Morrison et al 2015, Long-Term Outcomes
<sup>14</sup> Mukai et al 2017, Vaginoplasty with
<sup>15</sup> Papadopoulos et al 2020, Psychological Pathologies
<sup>16</sup> Papadopoulos et al 2017, Combined vaginoplasty
<sup>17</sup> Perovic et al 2000, Vaginoplasty in
<sup>18</sup> Raigosa et al 2015, Male-to-Female
<sup>19</sup> Reed et al 2015, Non-grafted Vaginal
<sup>20</sup> Rehman et al 1999, The reported sex
<sup>10</sup> Lindemalm et al 1986, Long-term
<sup>11</sup> Lindemalm et al 1987, Prognostic factors
<sup>12</sup> Mate-Kole et al 1990, A controlled study
<sup>13</sup> Morrison et al 2015, Long-Term Outcomes
<sup>14</sup> Mukai et al 2017, Vaginoplasty with
<sup>15</sup> Papadopoulos et al 2020, Psychological Pathologies
<sup>16</sup> Papadopoulos et al 2017, Combined vaginoplasty
<sup>17</sup> Perovic et al 2000, Vaginoplasty in
<sup>18</sup> Raigosa et al 2015, Male-to-Female
<sup>19</sup> Reed et al 2015, Non-grafted Vaginal
<sup>20</sup> Rehman et al 1999, The reported sex
| Study | Design | LoE | Sample size | Age range | Sexual topics | Methods/Tools | Outcomes regarding Sexual Wellbeing |
|-------|--------|-----|-------------|-----------|---------------|---------------|----------------------------------|
| Rehman et al 1999, Formation of | Outcome measures | 4 | 10 AMAB | 23–60 | Clitoral sensitivity, QoL, sexual orientation, sexual activity, type of sexual contact (oral, anal, vaginal, other), sexual satisfaction, orgasm (ability and importance), lubricant use, reasoning for sexual inactivity | Interview, self-developed questionnaire | postoperatively, 15 (53.6%) could orgasm, 7 (25%) orgasmed infrequently and 6 (21.4%) could not orgasm. |
| Salgado et al 2018, Primary Sigmoid | Outcome measures | 4 | 12 AMAB | M 47 (SD 15.4) | Vaginal dimensions, reported sensation, intercourse, satisfaction with depth, colour and excessive secretions | Chart review | 5 (62%) had intercourse and reported satisfaction with vaginal depth and pleasurable sensitivity. None experienced malodour or excessive secretions. |
| Schroder et al 1999, New women | Outcome measures | 4 | 17 AMAB | 35–58 | Orgasm, masturbation, sexual fantasies, intercourse, relationship status, sexual orientation, sexual satisfaction, genital and breast sensitivity, arousal, sexual desire | Postoperative Male-to-Female Questionnaire (Carroll & Schroder, 1993a), New Woman’s Gynaecological Index (NWGI) (Schroder, 1993), Stress Inventory (Carroll, 1985), Postoperative Male-to-Female Interview (Carroll & Schroder, 1993b), vaginal plethysmography | Mean self-reported rating of sexual satisfaction was 5.4 (0–10 scale, 10 is better). 11 (64.7%) could orgasm through masturbation (8 with ease, 3 with difficulty); 5 achieved multiple orgasms, and 5 ejaculated. Of n = 16 sexually active (approximately half had intercourse): 9 orgasmed during partnered activity (4 through penile-vaginal penetration, 3 through masturbation with a partner present). |
| Seyyed-Forootan et al 2018, Autologous Fibroblast | Group comparison/follow-up study | 4 | 24 AMAB | Fibroblast: 28 SD 4y Amnion: 32 SD 3y | Vaginal dimensions, secretions, intravaginal sensitivity, orgasm, intercourse, satisfaction with intercourse | Self-developed questionnaire, interview, clinical examination of vaginal dimensions | Neo-vaginal sensitivity and lubrication was good for everyone. 18 (75%) had sexual experiences; 93.7% of the fibroblast and 87.9% of the amnion group were satisfied with orgasm and intercourse. Average clitoral tactile thresholds were 12.5 g/mm², average vibration threshold was 0.3 m. Surgical complications were not associated with diminished clitoral sensitivity or orgasmic capacity. |
| Sigurjónsson et al 2017, Long-Term Sensitivity | Outcome measures | 4 | 22 AMAB | 23–63 | Clitoral sensitivity, orgasm, sexual dysfunction | Semmes-Weinstein monofilaments, Bio-Thesiometer, self-developed scale | Average clitoral tactile thresholds were 12.5 g/mm², average vibration threshold was 0.3 m. Surgical complications were not associated with diminished clitoral sensitivity or orgasmic capacity. |
| Soli et al 2008, Male to female | Outcome measures | 4 | 15 AMAB | 21–60 | Orgasm, clitoral sensitivity | Interview, self-developed questionnaire | 7 (56.7%) experienced some form of climax during intercourse. Clitoral sensitivity was present and pleasant for every individual, and was present during digital examination by the authors. |
| Stanjevic et al 2007, Sacrospinous ligament | Outcome measures | 4 | 62 AMAB | 18–58 | Ability to perform intercourse | Chart review | 42 (76%) had intercourse. |
| Stein et al 1990, Follow-up observations | Follow-up study | 4 | 22 AMAB | 20–49 | Orgasm, vaginal intercourse, pain during intercourse, need for lubricants | Interview, physical examination | 2 (14.3%) had never orgasmed, 6 (43%) seldom, 2 (14.3%) usually, NA for 4 (28.6%). Orgasm was not at all important for sexual satisfaction for 3 (21.4%), somewhat important for 6 (42.9%), very important for 1 (7.1%), NA for 4. 7 (31.8%) had intercourse; 1 (4.3%) used lubricants always, 3 (42.9%) often, 1 (3.9%) never, unknown for 2 (28.6%). Of n = 6 (66.7%) had intimate lovers prior to GAS, 3 (33.3%) did not. |
| Tavakkoli Tabassi et al 2014, Fold-back | Outcome measures | 4 | 112 AMAB | M 25.8 (SD 3.3) | Satisfaction with function | Chart review | 96 (85.7%) were satisfied with the appearance and function, 16 (14.3%) were dissatisfied (10 due to depth or stenosis, 6 due to aesthetics). |

(continued)
| Study                                      | Design                          | LoE   | Sample size | Age range | Sexual topics                                                                 | Methods/Tools                                                                 | Outcomes regarding Sexual Wellbeing                                                                                                                                 |
|-------------------------------------------|---------------------------------|-------|-------------|-----------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Thalavirithan et al 2018, Application of embryonic | Cross-sectional study           | 4     | 130         | 26–28     | Satisfaction with sexual function, frequency of sexual activities (oral, anal), orgasm, sexual satisfaction | Self-developed questionnaire, clinical examination | 26 (86.6%) could orgasm, 30 (100%) had intercourse. Frequency of receptive oral sex increased and anal sex decreased significantly following GAS. Satisfaction with sexual function and the appearance of the labia, vulva and clitoris was very good for 98% (5-point scale, unsatisfactory-very good). Sexual satisfaction was statistically (positively) correlated with vaginal function and depth, clitoral sensation, appearance of the vulva/labia minora, and natural lubrication and negatively correlated with depression scores. |
| Toolenaar et al 1993, The occurrence of   | Cross-sectional study           | 4     | 6 women with MRKHS | 19–28    | Intercourse, lubricant | Self-developed questionnaire, clinical examination | 14 (82.4%) had regular intercourse, 3 (17.6%) did not have a sexual partner. 15 (88.2%) made use of lubricants. 13 (76.5%) experienced white discharge, 15 (88.2%) slight blood loss (6 following intercourse, 9 spontaneously). 3 experienced vaginal cramping (1 solely following sex). |
| van der Sluis et al 2016, Long-Term      | Outcome measures                | 4     | 24 AMAB     | 22–73     | Intercourse, adequacy of vaginal dimensions, sexual arousal, orgasm, desire, lubrication, sexual satisfaction, discomfort | Female Sexual Function Index (FSFI), Amsterdam Hyperactive Pelvic Floor Scale for Women, (AHBBS) Female Genital Self-Imaging Scale (FCSIS), self-developed questionnaire | 8 (89%) had intercourse, 1 had never. Mean FSFI satisfaction domain score was 4.2 (SD 1.3), mean score for orgasm 4.0 (SD 2.2), 8 (89%) had performed (frequent) penetrative intercourse, orgasm was possible through direct neo-clitoral stimulation. 8 (89%) had intercourse frequently, depth was adequate. 1 did not have intercourse (identified as asexual). Sexual arousal was possible, orgasm could be reached through neo-clitoral stimulation. |
| van der Sluis et al 2016, Morphological  | Outcome measures                | 4     | 26 AMAB     | 19–52     | Sexual activity (type of activity), sexual preferences, lubricant use, condom use, vaginal symptoms (discharge, odour, pain) | Self-developed questionnaire, clinical examination | 8 (31%) reported discharge, 4 (7%) 1 (4%) reported tenesmus, 4 (25%) neo-vaginal pain (3 of which during deep penetration). |
| Wagner et al 2010, Male-to-female         | Outcome measures                | 4     | 50 AMAB     | 25–52     | Satisfaction with vaginal dimensions, orgasm, intercourse, pain during sex | Self-developed questionnaire | 35 (70%) had achieved clitoral orgasm, 42 (84%) had regular intercourse (2 of which reported pain during intercourse). |
| Watanyusakul 2019, Vaginoplasty Modifications  | Outcome measures                | 4     | 580 AMAB    | 18–65     | Vaginal depth | Not specified | Average depth >1 y follow-up was 10.0 cm. |
| Weyers et al 2009, Long-term assessment   | Follow-up study                 | 3     | 50 AMAB     |           | Importance of sex, sexual functioning, relationships (status and quality), sexual preference | Female Sexual Function Index (FSFI), serum hormone levels, self-developed questionnaire | 3 (6%) were not interested in sex. Median score for importance of sex in a relationship was 6 (interquartile range 5–9; 0–10 scale). Mean FSFI total score was 16.95 (SD 10.04). Overall FSFI scores were positively correlated with sexual satisfaction, general health perception and satisfaction with female appearance as perceived by others. FSFI total scores were highest for heterosexual individuals, intermediate for bisexual and lowest for homosexual individuals. There was no correlation between estradiol levels and mode of estrogen administration with testosterone levels and FSFI scores. |
| Wu et al 2009, Laparoscopic vaginal       | Outcome measures                | 4     | 67 DSD women, 7 Cis women |           | Intercourse (time between surgery and first contact), orgasm, lubrication, satisfaction with sexual life, vaginal dimensions, dyspareunia, bleeding during intercourse | Chart review, self-developed questionnaire | 71 (88.4%) was sexually active. More than half reported frequent orgasms, and 90% reported adequate lubrication for intercourse. None reported dyspareunia, use of external lubrication, or mild bleeding during intercourse. |
| Zazlin et al 2017, Male-to-Female         | Follow-up study                 | 4     | 49 AMAB, 40 with questionnaire results |           | Intercourse (satisfaction with), (satisfaction with) orgasmic capacity, orgasm, | Self-developed questionnaire | Mean scores for satisfaction on 0–10 scale (10 is better) with |
Subjective arousal and desire were similarly experienced by a majority (79,1%) of postsurgical women. Twenty-four studies discussed whether participants could attain orgasm. A majority (about 70%) could achieve orgasm, whereas less than 10% could not or had not tried, and another 10% chose ‘not applicable.’ Five studies applied the Female Sexual Function Index (FSFI) and reported a mean orgasm domain score ranging between 2.82−3.9 (scores CIS women without sexual problems 5.1 SD1.1). Finally, Zavlin et al found a mean frequency of achieving orgasm of 6.73 (SD 3.32) during masturbation and 6.52 (SD 3.11) during intercourse.

Over half of participants masturbated regularly, and every participants had engaged in receptive vaginal activity. Some, however, failed at penetrative sex, either because of short time since surgery, inadequate vaginal dimensions or pain. Reporting on other sexual activities, for example, receptive anal sex and- active and passive- oral sex was limited. Whether GAS brings about a change in sexual activities remains unclear, this data and associations between presurgical and postsurgical sexual activity were not provided.

Overall sexual satisfaction or satisfaction with sex life (77%), satisfaction during sex, and satisfaction with orgasmic function was present in a majority of postsurgical individuals.

Some studies reported on sexual dysfunction, where sexual wellbeing was mostly defined as a lack of sexual dysfunction. Ten studies discussed pain during receptive vaginal sex in AMAB individuals; one third experienced either pain in or around the introitus, deep or superficial dyspareunia or vulvodynia. Difficulties for AMAB individuals during penetrative sex were described in 10 studies: a third experienced difficulties or were unable to perform receptive vaginal sex, due to inadequate vaginal depth or width.

**Breast Augmentation**

Statement #10 The gender surgeon is advised to suspend breast augmentation in trans individuals AMAB until 12 months of hormone therapy have been completed (Level III Grade C)

Statement #11 The gender surgeon is advised to consider fat grafting as available alternative to or extension of implant use in trans individuals AMAB (Level IV Grade C)

Statement #12 The gender surgeon should counsel the trans individuals AMAB on risks associated with implant use (Level III Grade B)
Evidence. Feminizing hormone therapy might yield unsatisfactory breast development. Individuals might not reach the final stages of breast development and opt for breast augmentation, which may improve feminine contour, increase subjective feelings of femininity, aid in passability and adjustment to the female gender role, and consequently increase sexual and psychosocial wellbeing. Choice of augmentation technique is dependent on both patient and surgeon’s preference.

Patients should be counselled on implant type, implant surface and placement. Care must be taken to properly centre the implant under the nipple-areolar complex (NAC) to prevent diverging nipples and wide cleavage. Implant placement more medial of the NAC can be considered in individuals with a laterally placed NAC, or surgical medialization of the NAC can be pursued.

Implant use is advantageous in regard to predictability of results. Associated risks, however, are capsular contracture, implant malposition, autoimmune responses and Breast Implant Associated Anaplastic Large Cell Lymphoma (BIA-ALCL). Fat grafting provides an alternative to implant use, eliminating the risk of BIA-ALCL. Fat grafting can be done solitary, in conjunction with implant use, as well as during secondary corrections. Breast cancer screening should be performed according to the local guidelines.

Sexual Wellbeing. One study reported on sexual wellbeing following breast augmentation, finding a significant increase in sexual wellbeing four months postoperatively (Table 3).

Vocal Feminization Surgery

Statement #13 The Ear, Nose and Throat (ENT) surgeon should consider vocal feminization surgery when treatments with speech-language pathologists have yielded unsatisfactory results in trans individuals AMAB (Level IV Grade D)

Evidence. Consulting an ENT surgeon prior to starting with speech therapy is recommended, to rule out vocal cord anatomy and functioning anomalies. Surgery may be considered if speech therapy yields unsatisfactory results. Surgical results are unpredictable.

Sexual Wellbeing. We found no studies on sexual wellbeing after vocal feminization surgery in AMAB individuals.

Facial Feminization Surgery (FFS)

Statement #14 The gender surgeon should treat secondary facial aspects before beginning structural facial GAS in trans individuals AMAB (Level IV Grade C)

Statement #15 The gender surgeon is advised to consider adjustments of the frontonasal-orbital complex, the nose, the lower jaw and the thyroid cartilage when performing FFS in trans individuals AMAB (Level IV Grade C)

Evidence. Secondary or non-skeletal facial aspects, such as hair and hairline, facial hair, skin texture, and the distribution and volume of facial fat can be heavily determined by hormonal influence, generally responding well to hormone therapy, which in itself does not interfere in any way with surgery. In addition, many AMAB will opt to undergo laser facial hair removal or electrolysis. It is therefore preferable to treat the secondary aspects before beginning structural or skeletal facial gender confirmation surgery (at least 12 months before surgery). Obtaining a female bone structure while maintaining male secondary aspects is self-defeating to both the result and the perception of the patient’s femininity. The expectations for the results will be more real if the initial anticipation, both psychological and physical, is realistic.

Adjustments of the frontonasal-orbital complex, the nose, the lower jaw and the thyroid cartilage are elements of Facial Feminization Surgery (FFS). Forehead reconstruction and hairline corrections-approached through a coronal or hairline incision open up the upper face. Lower jaw contouring corrects the lower face by reducing the transverse and vertical dimensions of the jaw, softening the angle of the mandible, improving jawline contour and adjusting of the volume, format and position of the chin. The midface may be addressed with rhinoplasty.

Sexual Wellbeing. We found no studies on sexual wellbeing after facial feminization surgery (FFS).

SURGICAL PROCEDURES FOR MASCLINIZING GAS

This section addresses different types of masculinizing GAS, with their respective results regarding sexual wellbeing. Decision making is on patient preference and patient specifics.

Table 3. Sexual wellbeing following breast augmentation

| Study            | Design    | LoE   | Sample size | Age range | Sexual Topics | Methods/Tools | Outcomes regarding Sexual Wellbeing |
|------------------|-----------|-------|-------------|-----------|---------------|---------------|-------------------------------------|
| Weigert et al 2013 | Follow-up study | 4     | 35 AMAB     | 18.9–62.6 | Sexual wellbeing | Breast-Q    | Sexual wellbeing: 4 mo post-op: ↑ 34 points 12> mo post-op: ↑ 33 points |

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Mastectomy

Statement #16 The gender surgeon is advised to consider performing a mastectomy in trans individuals AFAB prior to starting living in the desired gender, in selected cases of severe dysphoria and with large volume chests (Level IV Grade D).

Evidence. Masculinizing chest surgery may improve dysphoria, body image, psychological and sexual wellbeing and overall quality of life, and carries importance for AFAB individuals in this regard.\textsuperscript{38,179,180} Excess skin and glandular tissue is excised, whilst preserving subcutaneous fatty tissue to ensure flap vascularity and facilitating an acceptable contour of the chest wall. Techniques include the semi-circular technique, trans-areolar technique, concentric circular technique, free nipple technique with horizontal scar and the inferior pedicled mammoplasty technique, for "Breast size and mastectomy techniques" see Figure 1.\textsuperscript{156,181}

The semi-circular technique is applicable for very small breasts. The scar is confined to the lower half of the areola. Limited surgical exposure carries risk of increasing postoperative hematomas.\textsuperscript{181}

The trans-areolar technique allows for correction of the nipple by nature of the scar placement through the areola, horizontally. This carries increased risk of postoperative hematomas.\textsuperscript{156}

The concentric circular technique allows for correction of excess skin through an ellipse, or circle shaped, incision. May lead to skin puckering around the areola, areolar widening due to traction- and nipple necrosis.\textsuperscript{156,181}

The horizontal scar and free graft technique allow for correction of very large breasts. It is met with large scars, NAC depigmentation and partial graft loss.\textsuperscript{148,181} The inferior pedicled mammoplasty technique is comparable, whilst transposing the NAC on an inferior pedicle, instead of a free graft.\textsuperscript{156}

Masculinizing hormone therapy may ameliorate breast cancer risk.\textsuperscript{155} Patients should, however, be made aware of residual breast tissue on the entire plane of dissection.\textsuperscript{182}

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**Figure 1.** Breast size, ptosis and skin elasticity in regards to mastectomy techniques. Grade I ptosis correspond with the areola placed on the level of the inframammary crease (IMC). Grade II corresponds with the nipple below the IMC and above the level of the gland, grade III corresponds with the areola below the IMC and below the contour of the gland.\textsuperscript{224} Cup size A corresponds with a breast volume of less than 150 cc in individuals with an under bust circumference of 70–75 cm; cup size B corresponds with a volume of 250–299 cc with an under bust of 70–75 cm; cup size C corresponds with 300–349 cc with an under bust of 70–75 cm.\textsuperscript{225,226}

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Sexual Wellbeing After Mastectomy. Three studies reported on sexual wellbeing after mastectomy, accessible in Table 4. These publications mostly focused on sexual relationships and quality of sex life. Mastectomy improved quality of life and confidence in social and sexual situations, in both dressed and undressed situations. Reduction of dysphoria, improvement of body image and confidence following mastectomy affected sexual relationships positively.\(^{38,183,184}\)

![Table 4: Sexual wellbeing following mastectomy](image)

| Study | Design | LoE | Sample size | Age range | Sexual Topics | Methods/Tools | Outcomes regarding Sexual Wellbeing |
|-------|--------|-----|-------------|-----------|---------------|---------------|-----------------------------------|
| Esmonde et al 2019 | Outcome measure | 4 | 58 AFAB | 18–48 | Sexual orientation, relationship status | Retrospective chart review | Surgery improved quality of life, sex life, and comfort in physical appearance with and without clothes. |
| Poudrier et al 2019 | Cross sectional study | 4 | 58 AFAB | 18–58 | Satisfaction with sex life, sexual confidence (sexually confident without a shirt, likely to remove shirt for sex), comfortable during sexual activities, sexually attractive in clothes, when unclothed | Custom questionnaire | Most respondents rated their quality of life and sexual confidence before top surgery as very low. Post-op, quality of life and sexual confidence improved significantly in all domains. |
| van de Grift et al 2016 | Follow-up study | 4 | 26 AFAB | 18–59 | Sexual orientation, sufficiency as sexual partner, pleasure of sexual activities | Appearance Schemas Inventory Revised, Body Image Quality of Life Inventory (BIQLI), Body Image Scale for Transsexuals (BIS), Multidimensional Body-Self Relations Questionnaire, Rosenberg Self-Esteem Scale, Perceived Effect of Surgery (self-developed) | Mastectomy positively influences body image. Positive evaluation of the body and decreased dysphoria during social situations — increased quality of life and self-esteem. |

Sexual Wellbeing After Removal of the Female Sexual Organs. We found no results of studies on sexual wellbeing in trans individuals AFAB after removal of the female sexual organs.

Metaidoioplasty

Statement #19 The gender surgeon should suggest metadoioplasty as a variant of one-stage neo-phalloplasty in masculinizing genital GAS in trans individuals AFAB (Level IV, Grade C)

Statement #20 The gender surgeon should advise postoperative genital stretching to prevent genital shrinkage after metadoioplasty in trans individuals AFAB (Level IV, Grade D)

Statement #21 The gender surgeon should engage in shared decision making and counselling in choosing type of genital masculinisation surgery in trans individuals AFAB (Level II Grade D)

Statement #22 The gender surgeon is advised to counsel trans individuals AFAB on the specific advantages of a metadoioplasty being preservation of sexual arousal, erogenous sensation and spontaneous erections (Level IV Grade D)

Statement #23 The gender surgeon is advised to counsel trans individuals AFAB on the specific disadvantages of a
metaidoioplasty being; possible lack of length for penetration or to void standing (Level IV Grade D)

Evidence. Metaidoioplasty can be carried out as a one-stage procedure, with removal of the female sexual organs, optional urethral lengthening, scrotalplasty and testicular implants placement.186,187 The majority of the lengthening of the clitoris is achieved through ventral division of the urethral plate. Additional length may be obtained by dividing the clitoral suspensory ligaments.188,189 Clitoral length should be sufficient for voiding while standing when urethral lengthening is requested, studies do not report on what is meant by “sufficient”. The technique for urethral lengthening is dependent on patient anatomy and tissue quality, options include pedicled labia minora grafts and buccal mucosa grafts. Having non-overlapping suture lines and covering suture lines with vascularized tissue prevent fistulation.146,189,191 Scrotoplasty is achieved through labial tissue,192 testicular implants can be inserted.192,193 Postoperative genital stretching- either manual, vacuum-assisted or with PDE5 inhibitors- may prevent genital shrinking. However, evidences on this topic are poor.189,191,193

Choices on genital masculinization surgery are increasingly being made through shared decision-making.51 The surgeon should inform the patient on the different options (metadoioplasty and phalloplasty), the techniques available, their advantages and disadvantages, limitations with producing ‘ideal’ results and possible risks and complications.52–54

Common minor complications are urinary tract infections and bladder overactivity. Minor urethral fistulae and strictures can be managed non-surgically, revision surgery is indicated for major fistulae and strictures,186,194 regenerating vaginal mucosa,186,193,194 and displaced or expelled testicular implants.

Sexual Wellbeing After Metaidoioplasty. Sexual wellbeing was reported on in six publications, provided in Table 5.146,187,189,193,195–197 Five of these publications may contain an overlap in study population.

Metaidoioplasty provided satisfying aesthetics and positive outcomes regarding sexual wellbeing, sensation, erectile function and orgasm. Sexual arousal, which resulted in erection, and sensation were present in every individual.146,187,189,193,197 A majority of participants had masturbated, which had not resulted in orgasm for everyone,146,187,193,197 and insufficient length for penetrative sex proved the main disadvantage.146,193,197 An average of 10% initially opting for metaidoioplasty, pursued conversion to phalloplasty at a later stage.

Phalloplasty or Total Phallic Construction (TPC)

Statement #24 The gender surgeon should provide trans individuals AFAB the radial free forearm flap (RFFF) phalloplasty as the technique of choice for masculinizing genital GAS in patients desiring a full-size phalloplasty, accompanied by urethral lengthening (Level IV, Grade D)

Statement #25 The gender surgeon should be capable to offer alternatives to the free forearm flap (RFFF) in trans individuals AFAB, like: the antero-lateral thigh flap (ALT), pedicled pubic phalloplasty (PP) or latissimus dorsi (LD) phalloplasty as an alternative full-size phalloplasty with or without urethral lengthening (Level IV, Grade C)

Statement #26 The gender surgeon is advised to combine a skin flap (RFFF or pedicled superficial circumflex iliac artery perforator flap) for urethral lengthening, when a single-flap reconstruction cannot be accomplished, in trans individuals AFAB (Level IV, Grade C)

Statement #27 The gender surgeon should engage in shared decision making and counselling in choosing type of genital masculinization surgery, in trans individuals AFAB (Level II Grade D)

Statement #28 The gender surgeon is advised to counsel, trans individuals AFAB, on the specific disadvantages of a phalloplasty being; volume in genital area when dressed, possibility of penetration (Level IV Grade D)

Statement #29 The gender surgeon is advised to counsel, trans individuals AFAB, on the specific disadvantages of a phalloplasty being; cutaneous and erogenous sensitivity can be poor (Level IV Grade D)

Evidence. Total Phallic Construction (TPC) aims at creating a phallus with acceptable aesthetics, a degree of cutaneous and erogenous sensitivity and sufficient bulk to house potential erectile prostheses. Standing urination is achieved through urethral lengthening. Techniques include: the radial free forearm flap, suprapubic pedicled pubic (PP), superficial circumflex iliac artery perforator flap (SCIP), antero-lateral thigh flap (ALT) and the latissimus dorsi flap (LD) techniques. Table 6 shows donor sites, flap types, urethral lengthening options, sensation, advantages and disadvantages of all flaps. The RFFF presents superior aesthetics and functionality, allowing for integrated urethral lengthening.198–201 compared to other techniques, and is considered “the gold standard” by some.202 RFFF-TPC is commonly carried out in three stages of six-month intervals: the creation of the phallus and neo-urethra, microsurgically anastomosed; glans- and corona-plasty using a full-thickness skin graft; and potential erectile prosthesis implantation. Proper preparation reduces donor-site morbidity and full-thickness skin grafts result in less scarring and discoloration.203,204 Interposition of collagen-matrix, between the recipient site and a split-thickness skin graft, simulates the appearance of a full-thickness skin graft without hair. The pedicled pubic phallus is fashioned from a cutaneous flap that is raised from the inferior aspect of the abdominal wall, allowing for primary closure of the donor site.205 Both the PP flap and the SCIP flap are Hair-Bearing, have poor cutaneous sensitivity and difficult urethral lengthening. Direct urethral lengthening is carried increased risk of complications, delayed incorporation of a
| Study | Design | LoE | Sample size | Age range | Sexual Topics | Methods/Tools | Outcomes regarding Sexual Wellbeing |
|-------|--------|-----|-------------|-----------|---------------|---------------|-----------------------------------|
| Djordjevic et al 2013 | Group comparison / Follow-up study | 4 | 207 AFAB | 18–62 | Neo-phallic dimensions, erection of the clitoris, sensation, sexual arousal, masturbation, orgasm, sexual intercourse | Chart review | Length of neophallus ranged from 6 cm−10 cm. Majority; pleased with the aesthetic appearance. All: erection of the clitoris and completely preserved sensation. None: problems or difficulties in sexual arousal, masturbation, or orgasms. Patients who reported sexual intercourse with partners: length of the neophallus was inadequate for full penetration. |
| Djordjevic et al 2009 | Outcome measure | 4 | 82 AFAB | 18–54 | Erection of the clitoris, sensation | Chart review | All: erection of the clitoris and completely preserved sensation. |
| Djordjevic et al 2018 | Erection, sexual arousal, sensation, organ, neo-phallic sensation (tactile, erogenous), sexual intercourse | Retrospective chart review | Majority: pleased with the aesthetic appearance. All: erection of the clitoris and completely preserved sensation. None: problems or difficulties in sexual arousal, masturbation, or orgasms. Patients who reported sexual intercourse with partners: length of the neophallus was inadequate for full penetration. |
| Stojanovic et al 2017 | Outcome measure | 4 | 374 AFAB | 18–43 | Sexual function, quality of erection, sexual arousal, erogenous sensation | Chart review | Majority: complete satisfaction with appearance, overall complete sexual satisfaction and always experienced orgasm during masturbation. All: good quality of erection, sexual arousal, and completely preserved erogenous sensation. |
| Takamatsu et al 2009 | Outcome measure | 4 | 43 AFAB | 18–33 | Sensitivity, intercourse | Chart review | One patient: intercourse with his female partner. No complaints of a reduction of erogenous sensation on the clitoral glans. |
| Van de Grift et al 2019 | Cross sectional study | 4 | 38 AFAB | Average 40 (SD 10) | Arousalability, sexual sensation, sexual pleasure, interest in sex, sexual initiative, orgasmic capacity/ intensity, satisfaction with genital appearance, satisfaction with sexual functioning/relationships, sexual orientation, use of genitals during sexual contact, the influence of GAS on sexual outcomes | Custom questionnaires | Not specific for metoidioplasty. Majority: sexually active. Areas of improvement after surgery: use and enjoyment of both chest and genitals, arousalability, sexual interest, and pleasure. Genital GAS positively impacts transmen’s sexuality, issues with genital sensation or penetration may exist. |
| Vukadinovic et al 2014 | Outcome measure | 4 | 97 AFAB | 18–41 | Sexual arousal, masturbation, orgasm, ability to perform penetration, sexual activity (type of activity), quality of erection, erogenous sensation, sexual satisfaction | Biographical Questionnaire for Transsexuals and Transvestites, self-developed questionnaire | Majority: complete satisfaction with appearance, overall complete sexual satisfaction and always experienced orgasm during masturbation. All: good quality of erection, sexual arousal, and completely preserved erogenous sensation. Patients who reported sexual intercourse with partners: length of the neophallus was inadequate for full penetration. |
free radial artery based flap bears less complications and is not prone to sacculcation. The ALT flap is a reasonable option established from a pedicled Fascio-Cutaneous flap of the perforating vessels of the vastus lateralis and rectus femoris. Pedicle length is commonly sufficient for tunnelling to the pubic area, obviating microsurgical techniques. A thick fat layer and hair complicate integrated urethral lengthening, often requiring other flaps for urethral lengthening. Cutaneous sensation is moderate due to the presence of one cutaneous nerve within the flap. The donor site is usually covered with split-thickness skin grafts. The LD flap allows for a larger myocutaneous flap based on the thoracodorsal artery and nerve, allowing for primary closure of the donor site. Cutaneous sensation is poor as a single motor nerve is available. Urethral lengthening requires multi-stage buccal mucosa and labia minora flaps.

As stated in the metadioplasty section choices on genital masculinization surgery are increasingly being made through shared decision-making. The surgeon should inform the patient on the different options (metadioplasty and phalloplasty, the techniques available, their advantages and disadvantages, limitations with producing ‘ideal’ results and possible risks and complications.

### Sexual Wellbeing After Phalloplasty

Eighteen studies reported on sexual wellbeing after phalloplasty, provided in Table 7. Outcomes for various surgical techniques were often pooled, separate results were rarely provided. Four pairs of studies may have had an overlap in study population.

Five studies reported on postsurgical sensation, which was present in 86.3%. Most experienced partial sensation, either in the buried clitoral site, the shaft, the neo-urethra and sensation projecting to the thigh. Postsurgical orgasm was discussed in three studies. Garcia et al. and Wierckx et al. reported that 92% and 97.8% were able to reach orgasm, respectively, and Van de Grift et al. found that orgasmic capacity increased in 18%, was unchanged in 52% and decreased in 26%.

Ten studies reported on the possibility of penetrative sex, which ranged between 38.8%–85%.

### CONCLUSIONS

This position statement provides healthcare providers with recommendations that may aid in decision making regarding GAS. Although findings may suggest positive outcomes regarding sexual wellbeing following vaginoplasty, mastectomy, metodioplasty, and phalloplasty, the overall quality of evidence is still low and most recommendations of this position statement are Level of Evidence C.

Not only methods of data gathering and reporting vary, some forms of GAS are not studied at all when it comes to effects on sexual wellbeing. Therefore, we advise more research on the effects of orchietomy-only, breast augmentation, vocal feminization surgery, facial feminization surgery and the removal of the female sexual organs on sexual wellbeing in trans individuals.

In trans individuals AMAB; breast augmentation is mostly studied with a focus on surgical techniques. Data on sensitivity, functioning and sexual wellbeing are lacking.

Next to the effects of FFS on sexual wellbeing, further research focusing on separate aspects of FFS is encouraged and necessary.

The majority of questionnaires that were applied in evaluating sexual activity after GAS in trans individuals AMAB, were validated for cis women- in heterosexual relationships, who engaged
| Study                        | Design               | LoE | Sample size | Age range | Sexual Topics                                      | Methods/Tools                        | Outcomes regarding Sexual Wellbeing |
|-----------------------------|----------------------|-----|-------------|-----------|---------------------------------------------------|--------------------------------------|---------------------------------------|
| Bettocchi et al 2005        | Outcome measure      | 4   | 85 AFAB     | 19–54     | Possibility to have penetrative sexual intercourse | Chart review                         | Penetrative sex:                      |
|                             |                      |     |             |           |                                                   |                                      | 16 without penile prosthesis          |
|                             |                      |     |             |           |                                                   |                                      | 17 with prosthesis (n = 8 malleable; n = 9 Dynaflex) | |
|                             |                      |     |             |           |                                                   |                                      | 6 lost malleable prosthesis through skin erosion |
| Djordjevic et al 2018 Novel | Outcome measure      | 4   | 694 AFAB    | 18–62     | Erection, sexual arousal, masturbation, orgasm, neo-phallic sensation (tactile, erogenous), sexual intercourse | Retrospective chart review            | Metaiodioplasty:                      |
|                             |                      |     |             |           |                                                   |                                      | None reported difficulties or problems related to sexual arousal, masturbation or orgasm |
|                             |                      |     |             |           |                                                   |                                      | Phalloplasty:                         |
|                             |                      |     |             |           |                                                   |                                      | Erogenous sensation based on clitoral stimulation in all |
|                             |                      |     |             |           |                                                   |                                      | None reported problems or difficulties in sexual arousal, masturbation or orgasms |
|                             |                      |     |             |           |                                                   |                                      | Sexual intercourse with complete penetration was totally adequate in all with penile implants |
| Falcone et al 2018          | Outcome measure      | 4   | 247 AFAB    | 21–69     | Phallic sensation, sexual intercourse, orgasm, partner satisfaction | Chart review, Self-developed questionnaire | Satisfactory phallic sensation: 83% |
|                             |                      |     |             |           |                                                   |                                      | Penetrative sexual intercourse: 77% |
|                             |                      |     |             |           |                                                   |                                      | Partner satisfaction: 60% |
| Fang et al 1999             | Outcome measure      | 3   | 22 AFAB     | No data   | Erotic sensation of the clitoris, neophallus sensation, orgasm, masturbation, intercourse | Chart review                         | All preserved clitorises had erotic sensation |
|                             | Phalloplasty in      |     |             |           |                                                   |                                      | Erotic sensation on neophallus: 8 (shaft, hypothesis: coapted forearm cutaneous nerves to ilioinguinal and iliohypogastric nerves) |
|                             | Outcomes of          |     |             |           |                                                   |                                      | Orgasm by masturbation the neophallus only: 1 (pudendal nerve anastomosis) |
|                             | Total phalloplasty   |     |             |           |                                                   |                                      | Regular sex: 9 |
|                             |                      |     |             |           |                                                   |                                      | Orgasm during intercourse: 9 |
|                             |                      |     |             |           |                                                   |                                      | Sexual performance: satisfactory 9 |
| Garaffa et al 2010 Total    | Outcome measure      | 4   | 115 AFAB    | 20–55     | Neo-phallic sensation, sexual activity            | Self-developed questionnaire         | Complete phallic sensation: 71.5% |
|                             | phallic             |     |             |           |                                                   |                                      | Sensation within neourethra: 14.7% |
|                             |                      |     |             |           |                                                   |                                      | Insensate phallic: 6% |
|                             |                      |     |             |           |                                                   |                                      | Recent surgery too early to assess 5.2% |
|                             |                      |     |             |           |                                                   |                                      | Phallics that were lost: 2.6% |
| Garcia et al 2014 Overall   | Outcome measure      | 3   | 5 AFAB      | M 35.1 (SD 2.23) | Erogenous sensation, orgasm, masturbation | Interview                           | SP: Suprapubic Phalloplasty 10      |
|                             | Overall satisfaction |     |             |           |                                                   |                                      | RAP+: Radial Artery free flap Phalloplasty with nerve anastomosis 5 |
|                             |                      |     |             |           |                                                   |                                      | RAP+: Radial Artery free flap Phalloplasty without nerve anastomosis 5 |
|                             |                      |     |             |           |                                                   |                                      | Orgasm pre-op: SP: 9 of 10 |
|                             |                      |     |             |           |                                                   |                                      | RAP+: 4 of 5 |
|                             |                      |     |             |           |                                                   |                                      | Orgasm: 7 of 10 |
|                             |                      |     |             |           |                                                   |                                      | Orgasm post-op |
|                             |                      |     |             |           |                                                   |                                      | SP: all |
|                             |                      |     |             |           |                                                   |                                      | RAP+: all |
|                             |                      |     |             |           |                                                   |                                      | RAP+: 8 of 10 |
|                             |                      |     |             |           |                                                   |                                      | Orgasm with direct stimulation of buried clitoris: |
|                             |                      |     |             |           |                                                   |                                      | SP: all |
|                             |                      |     |             |           |                                                   |                                      | RAP+: 4 of 6 |
|                             |                      |     |             |           |                                                   |                                      | Phalloplasty with phallic |
|                             |                      |     |             |           |                                                   |                                      | SP: 9 of 10 |
|                             |                      |     |             |           |                                                   |                                      | RAP+: all |
|                             |                      |     |             |           |                                                   |                                      | RAP+: 9 of 10 |
|                             |                      |     |             |           |                                                   |                                      | diminished orgasm after penile prosthesis: none |
|                             |                      |     |             |           |                                                   |                                      | regret of surgery: none |

(continued)
### Table 7. Continued

| Study | Design | LoE | Sample size | Age range | Sexual Topics | Methods/Tools | Outcomes regarding Sexual Wellbeing |
|-------|--------|-----|-------------|-----------|---------------|---------------|------------------------------------|
| Leriche et al 2008 Long-term outcome<sup>20</sup> | Outcome measure | 4 | 216 AFAB | 20–44 | Cutaneous sensitivity, erogenous sensitivity, sexual satisfaction, satisfactory sexual intercourse with penetration | Self-developed questionnaire | Cutaneous sensitivity of the phalloplasty: 83% Erogenous sensitivity: 9% Sexual satisfaction (penetration with penile implant): 59% |
| Moostrey et al 2009 Penile reconstruction<sup>22</sup> | Cross-sectional study | 4 | 280 AFAB, 7 men with various conditions | No data | Sensitivity, improvement in sexuality, orgasm, ability to perform penetration. | Chart review | Tactile sensitivity: 100% Improvement in sexuality: 80% Sexually active: 100% Explantation rate erection prosthesis: 44% Sexual intercourse with penetration: 80% |
| Noe et al 1974 The surgical construction (230) | Cross-sectional study | 4 | 12 AFAB | No data | Ability to perform penetrative sex, orgasm | Chart review | Intercourse: 10 of 12 Orgasm: 9 of 12 |
| Papadopoulos et al 2001 Usefulness of free<sup>24</sup> | Outcome measure | 4 | 24 AFAB | No data | Intercourse, phallic sensitivity, pain | Self-developed questionnaire, clinical and radiologic examination | Questionnaire score: 2 = excellent; 1 = acceptable; 0 = poor Sensibility: Free forearm flap: 1.41 Free fibula flap: 0.66 Intercourse: Free forearm flap: 0.83 Free fibula flap: 2 Pain: Free forearm flap: 1.41 Free fibula flap: 1.5 |
| Ranno et al 2007 Neo-phalloplasty with<sup>13</sup> | Cross-sectional study | 4 | 18 AFAB | 24–38 | Contractile power (measured and asked) | Clinical examination of phallic contraction power (measurement of weight lifted and electromyography) | “Paradox erection”: 18 Neo-phallus length (relaxed): 7–17 cm (mean 12.2 cm) Circumference (relaxed): 13–20 cm (mean 13.7 cm) Contract the muscle: all Average length reduction: 3.08 cm Average circumference enlargement: 4 cm |
| Ranno et al 2008 An objective<sup>14</sup> | Outcome measure | 4 | 22 MtF | No data | Intercourse, penile dimensions (relaxed and contracted) | Self-developed questionnaire, clinical examination | Sexual intercourse without the need for prosthesis Successful contraction when 2 cm shortened with average weight 1129 gr |
| Schaff et al 2009 A new protocol<sup>25</sup> | Outcome measure | 4 | 37 AFAB | No data | Intercourse (and it’s quality), sensation | Self-developed questionnaire, chart review | Fibula flap, sexual intercourse: Excellent: 100% Sensibility minor to forearm flap: 83.3% |
| Van de Grift et al 2019 Transmen’s experienced<sup>16</sup> | Cross-sectional study | 4 | 38 AFAB | Average 40 (SD 10) | Arousability, sexual sensation, sexual pleasure, interest in sex, sexual initiative, orgasmic capacity/intensity, satisfaction with sexual functioning/relationships, sexual orientation, use of genitals during sexual contact, the influence of GAS on sexual outcomes | Custom questionnaires | Sexual partner: 78% Sexual attraction: mainly women Use of chest during sex: 40% Use of genitals during sex: 78% Satisfaction with sexual function: Metaphaloplasty: 63.9% Phalloplasty: 28% Arousability: 13.3% ± 65%; Δ 3% Sexual sensation: 14.9% ± 59%; Δ 10% Sexual pleasure: 14.6% ± 47%; Δ 13% Interest in sex: 13.9% ± 45%; Δ 9% Sexual initiative: 12.6% ± 58%; Δ 10% Orgasmic intensity: 12.1% ± 52%; Δ 23% Orgasmic capacity: 18% ± 52%; Δ 26% |

(continued)
| Study                                    | Design               | LoE | Sample size | Age range | Sexual Topics                                                                 | Methods/Tools                  | Outcomes regarding Sexual Wellbeing                                                                                                                                 |
|-----------------------------------------|----------------------|-----|-------------|-----------|--------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vesely et al 2007 New technique         | Outcome measure      | 4   | 22 AFAB     | 24–38     | Ability to have sexual intercourse                                             | Self-developed questionnaire  | Sexual intercourse: 42% Muscle movement: 100% to stiffen the penis and/or move the penis during sexual intercourse. Penetration, but too short to keep inside: 11%. No sexual activity: 36%. Penetration not possible: 37% (too wide, too small, or too soft). |
| Wierckx et al 2011 Quality of life and  | Follow-up study      | 4   | 49 AFAB     | 22–54     | Relationship status, sexual preferences, sexual activities (frequency, type of activity, pain), sexual wellbeing, masturbation, sexual satisfaction, orgasm, arousal | Self-developed questionnaire  | Sexual orientation: Attracted to females: 42% Bisexual: 2 Attracted to males: 5 Relationship: 31 of 49 Gender of partner: Heterosexual woman: 24 Homo/bisexual woman: 4 Homo/bisexual man: 1 AMAB transsexual: 2 Freq sexual activities: 1-2/month: 48% Several times weekly: 30% Sexual satisfaction: (Very) satisfied: 64% Use of clitoris during coitus: Touching: before: 12,8% after: 13% Stimulation: before: 34% after: 38,3% Use of vagina during coitus: Touching: before: 5,8% after: 11,4% Penetration: before: 25,5% after: 11,4% Results with vs without erection prosthesis: Freq of masturbation: (More than) weekly: 64,5% vs 30,8% Freq of easy arousal: Half of time: 45,2 vs 53,8 Orgasm through masturbation: (Almost) always: 67,9% vs 58,3% Orgasm through coitus: (Almost) always: 38,9% vs 37,5% Change in orgasmic feelings: 64,9% vs 58,3% |
| Zuckerman et al 2015 Penile prosthesis | Outcome measure      | 4   | 15 AFAB     | M 35.6    | Sexual activity                                                                | Chart review                  | Sexually active post-implant: 85% |

AFAB = assigned female at birth (transmasculine individual, trans man); AMAB = assigned male at birth (transfeminine individual, trans woman); LoE = level of evidence (oxford centre for evidence-based medicine 2011); MRKHS = mayer rokitansky kuster hauser syndrome.
in penetrative sex-only. A substantial portion of aforementioned participants, however, were intimate with women, or did not have sexual relationships. Therefore, the development of specific questionnaires to evaluate the effect of GAS on the sexual wellbeing in trans individuals is needed.

In trans individuals AFAB; it is known that mastectomy is a viable option in improving gender incongruence, body image, psychological wellbeing, sexual wellbeing and overall quality of life. Evidence on sexual wellbeing after mastectomy is limited, focussing mainly on quality of sex life and sexual relationships.

In masculinizing genital GAS a metoidioplasty provides a sensate neophallus with the possibility to void standing, erotic satisfaction, and high levels of postsurgical satisfaction, with minimal donor site morbidity. However, there is need for validated questionnaires that can measure functionality, aesthetic appearance and patient satisfaction, to improve objective conclusions.

Furthermore, the unique anatomy of the male genitalia and the absence of tissue engineering options, to replace the smooth muscle of the corpora cavernosa and spongiosum, complicate TPC. The absence of comparative studies hampers selection of preferential techniques. Functional outcomes and patient satisfaction are difficult to comment on because of the lack of validated questionnaires to assess these outcomes.

Long-term effects of GAMI and GAS should also be studied, where after consensus on cancer screening in trans individuals should be formed, especially in hormone sensitive cancers or organs.

Next to the lack of studies on the effects of GAS and GAMI on sexual wellbeing, research on the development of validated questionnaires and patient-reported outcome measures may aid in producing less heterogeneous data.

To conclude, heterogeneous methods of data gathering and reporting and missing data on sexual wellbeing after orchietomy-only, vocal feminization surgery, facial feminization surgery and the removal of the female sexual organs further complicate the ability to draw robust conclusions, together with the lack of studies on the effects of GAS and GAMI on sexual wellbeing, emphasizing the need for future research. Future research on the development of validated questionnaires and patient-reported outcome measures may aid in producing less heterogeneous data. Researchers and clinicians alike should consider exchanging data and actively involve the transgender and gender-diverse community, in a bid to further improve not only surgical care, but trans-related care as a collective.

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SUPPLEMENTARY MATERIALS

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