Sexual and Physical Health After Sex Reassignment Surgery

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Sexual and Physical Health After Sex Reassignment Surgery

Griet De Cuypere, M.D.,[1,7] **Guy T'Sjoen, M.D.,**[2] **Ruth Beerten, M.Sc.,**[1,3]
Gennaro Selvaggi, M.D.,[4] **Petra De Sutter, M.D., Ph.D.,**[5] **Piet Hoebeke, M.D., Ph.D.,**[6]
Stan Monstrey, M.D., Ph.D.,[4] **Alfons Vansteenwegen, Ph.D.,**[3]
and Robert Rubens, M.D., M.Sc.[1,2]

A long-term follow-up study of 55 transsexual patients (32 male-to-female and 23 female-to-male) post-sex reassignment surgery (SRS) was carried out to evaluate sexual and general health outcome. Relatively few and minor morbidities were observed in our group of patients, and they were mostly reversible with appropriate treatment. A trend toward more general health problems in male-to-females was seen, possibly explained by older age and smoking habits. Although all male-to-females, treated with estrogens continuously, had total testosterone levels within the normal female range because of estrogen effects on sex hormone binding globulin, only 32.1% reached normal free testosterone levels. After SRS, the transsexual person's expectations were met at an emotional and social level, but less so at the physical and sexual level even though a large number of transsexuals (80%) reported improvement of their sexuality. The female-to-males masturbated significantly more frequently than the male-to-females, and a trend to more sexual satisfaction, more sexual excitement, and more easily reaching orgasm was seen in the female-to-male group. The majority of participants reported a change in orgasmic feeling, toward more powerful and shorter for female-to-males and more intense, smoother, and longer in male-to-females. Over two-thirds of male-to-females reported the secretion of a vaginal fluid during sexual excitation, originating from the Cowper's glands, left in place during surgery. In female-to-males with erection prosthesis, sexual expectations were more realized (compared to those without), but pain during intercourse was more often reported.

KEY WORDS: transsexualism; gender identity disorder; sexual functioning; orgasm; sex reassignment surgery.

INTRODUCTION

Hormonal treatment and sex reassignment surgery (SRS) are both considered the treatment of choice for transsexual persons. Evaluations of these treatments are still needed. In this study, a long-term follow-up investigation of 55 patients post-SRS was carried out to evaluate sexual and general health outcome. Since the start of the multidisciplinary Ghent Genderteam, we have always used a dual-phase hormonal schedule, with a first reversible part where sex specific features are suppressed, together with starting the real-life test. In the second part, cross-sex hormones were given, resulting in irreversible feminization and masculinization. In some centers, spironolactone (Prior, Vigna, & Watson, 1989) or cyproterone acetate (van Kesteren, Asscheman, Megens, & Gooren, 1997) are routinely added to estrogen treatment at the beginning of the hormonal treatment, whereas in other centers cross-sex hormonal treatment is started as a unique treatment. No randomized studies are as yet

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[1]Department of Sexology and Gender Problems, University Hospital Ghent, Ghent, Belgium.
[2]Department of Endocrinology, University Hospital Ghent, Ghent, Belgium.
[3]Institute of Family and Sexuality Studies, KU Leuven, Belgium.
[4]Department of Plastic Surgery, University Hospital Ghent, Ghent, Belgium.
[5]Department of Gynaecology, University Hospital Ghent, Ghent, Belgium.
[6]Department of Urology, University Hospital Ghent, Ghent, Belgium.
[7]To whom correspondence should be addressed at Department of Sexology and Gender Problems, University Hospital Ghent, De Pintelaan 185, B-9000 Ghent, Belgium; e-mail: griet.decuypere@uzgent.be.

available to determine the optimal dosage of hormones or the preferred regimen for the treatment of transsexuals. A variety of compounds are used in high dosages, increasing the risk of side effects (Asscheman & Gooren, 1992). The Amsterdam group reported a high incidence of depressive mood changes, hyperprolactinaemia, and thromboembolic events, compared to a normal population (Asscheman, Gooren, & Eklund, 1989).

The first aim of this study was therefore to evaluate the long-term safety of the Ghent hormonal treatment regimen. Secondly, where most studies on transsexual people focus on long-term psychological, surgical, and physical health (Eldh, Berg, & Gustafsson, 1997; Pfäfflin & Junge, 1998), a surprisingly small number of studies have focused on the sexual life of postoperative transsexuals, although adequate sexual functioning is universally acknowledged as an important component of mental health. Little attention has been given to this subject and, indeed, the vast majority of follow-up studies investigated the sexual functioning only as part of the psychological or the surgical outcome.

Although there is general agreement that female-to-male transsexuals are mostly attracted to females, discordant findings where female-to-male transsexuals were attracted to men have been reported by Chivers and Bailey (2000), indicating that this group may not be homogenous. Also Coleman, Bockting, & Gooren (1993) reported on nine female-to-male transsexuals sexually attracted to men. The group of male-to-females is known to be more heterogeneous and figures vary from 23 to 58% of male-to-females attracted to women (De Cuypere, Jannes, & Rubens, 1995; Smith, 2002). Until recently, it was also assumed that the sexual orientation of transsexual people did not change during transition. Daskalos (1998) reported on 6 male-to-females (out of 20) who described that their sexual orientation had switched from attraction to females to attraction to males. The respondents themselves explained these changes as part of their emerging female gender identity. Before SRS, they had tended to conform as "normal males," which implied being attracted to women. Most male-to-females look for a new partner after SRS, whereas female-to-males tend to remain with the same partner (Bodlund & Kullgren, 1996; Köckott & Fahrner, 1988; Steiner & Bernstein, 1981). It is remarked (Eldh et al., 1997; Köckott & Fahrner, 1988; Pfäfflin & Junge, 1990) that not all transsexual people wish to inform their new partners about their transsexual past and more male-to-females (up to one-third) than female-to-males manage to keep silent about their past.

Few studies deal with the topic of masturbation. Female-to-males are supposed to masturbate more frequently than male-to-females and more frequently than

before SRS (Kuiper, 1991; Smith, 2002; Sorensen, 1981a, 1981b). The data about reaching orgasm after SRS are very inconsistent throughout the literature. Lindemalm, Korlin, and Uddenberg (1986) reported that 54% of male-to-females were not able to reach orgasm. Blanchard, Legault, and Lindsay (1987) described that the capacity for orgasm in male-to-females decreased after SRS, which is contradicted by the data by Kuiper (1991). Pfäfflin and Junge (1990) and Eicher, Schmitt, and Berger (1991) described that 70–80% of the male-to-females were capable of orgasm even during intravaginal intercourse. Although not all postoperative transsexual people are orgasmic, there is a much wider sexual satisfaction after transition. It is possible to change one's body image and be sexually satisfied, despite inadequate sexual functioning (Lief & Hubschman, 1993). Recent studies show good genital sensitivity, probably as a result of advances in surgical techniques where, for example, in phalloplasty one forearm nerve is anastomosed to one of the dorsal clitoral nerves (Monstrey et al., 2001).

Our center is presently among those with extensive experience in phalloplasty (P.H and S.M). This gives us the opportunity to focus on the sexual consequences of this particular surgical intervention. As the number of male-to-females and female-to-males was similar and both groups had followed a similar procedure—screened and treated by the same professionals—we were able to compare the male-to-female and the female-to-male transsexuals for different topics of sexual health. Finally, this descriptive study also focused on lubrication during sexual arousal, as some postoperative male-to-female patients spontaneously mentioned this.

METHOD

Participants

In 1985, the Ghent Genderteam started treating persons with gender identity disorder using a multidisciplinary approach. The first surgery (a vaginoplasty) took place in 1988. Our surgeons have offered phalloplasty since 1993.

A total of 107 Dutch speaking patients who underwent SRS between 1986 and 2001 were contacted to participate in this study. We selected only Dutch speaking patients because they followed the same treatment procedure and also because of practical reasons (distance from the hospital and standardization of translated questionnaires). A minimum delay period of 1 year after SRS was respected. This year is often called the honeymoon period and therefore does not represent a realistic picture of

long-term emotional stability, sexual, and psychological status. Of the 107 patients who were eligible for the study, 30 could not be contacted (in majority male-to-females) and 15 (mainly female-to-males) declined to participate. Seven patients wanted to cooperate only if it did not involve attending the hospital visit. The other 55 participants (32 male-to-females and 23 female-to-males) completed the questionnaires and were subsequently interviewed on a face-to-face basis by a sexologist (R.B.), endocrinologist (G.T.), and examined by a surgeon (G.S.). None of the researchers had been involved in the initial assessment or treatment of the patients. All of the male-to-females underwent vaginoplasty, 21 female-to-males had a phalloplasty whereas 2 female-to-males had not yet made up their minds about having one. Most of the female-to-males chose to undergo a phalloplasty, as the outcome is mostly very satisfying. A total of 28 male-to-female transsexuals and 20 female-to-male patients agreed to additional blood testing (examination of hormonal parameters, lipids, glucose, and liver and renal function).

At our center, when the transsexual patient has passed the first diagnostic phase, she/he is referred to the endocrinologist for a general health survey and hormonal therapy. The treatment regimen used at our center is somewhat particular. The transsexual patient will first undergo a (reversible) chemical castration for approximately 1 year, before receiving hormones of the opposite sex, after which irreversible changes occur. The first reversible phase includes anti-androgens (e.g., cyproterone acetate 50–100 mg daily) in male-to-female transsexuals and progestins (e.g., lynestrenol 5 mg daily) in female-to-male transsexuals. The reversible phase is considered an important phase of the real-life test, in which gender-specific features, such as erections or menstrual bleeding, are suppressed. The dual-phase hormonal therapy gives the patient more opportunity for reflection and adaptation to the new sex. In the second part, cross-sex hormones are given for 1 year, resulting in irreversible feminization or masculinization. The administration of these hormones may lead to side effects, all the more so because the cross-sex hormones are administered life-long (Moore, Wisniewski, & Dobs, 2003). Surgical sex correction is considered after 2 years of hormonal therapy during which the patient has to pass *the real-life test or experience*: the patient has to live in the opposite sex role within her/his own personal and professional life when cross-sex hormones are started. Most gender teams have adopted the Standards of Care of the Harry Benjamin International Gender Dysphoria Association, which have clearly defined the indications and methods for hormonal and sex reassignment surgery of gender dysphoric patients (Meyer et al., 2001). The policy of our Genderteam implies a longer waiting period for cross-sex hormones compared to other centers, increasing the risk of self-medication. However, explanation of the rationale behind the protocol usually prevents patients from doing so.

The male-to-females were significantly older than the female-to-males at the time of SRS, $t(52) = -4.7, p < .001$, as well as at the time of research, $t(53) = -3.6, p = .001$ (Table I). The mean follow-up period was different for both groups, with a longer period for the female-to-males, $t(52) = 2.6, p = .013$. Regarding the duration of relationship, no significant difference between the two groups was found. For both male-to-females and female-to-males, there were no significant differences in age of the patient and their respective partners. A homosexual

Table I. Description of Study Participants

	Male-to-female (n = 32)		Female-to-male (n = 23)			
	M	SD	M	SD	t or χ^2	p
Age at time of SRS (years)	37.8	8.9	26.9	7.2	−4.7	<.001
Age at time of interview (years)	41.5	9.1	33.2	7.0	−3.6	.001
Duration of follow-up period (years)	3.8	2.7	6.2	4.2	2.6	.013
Duration of relationship (years)	5.1	5.1	5.2	5.2	<1	ns
Age of partner (years)	41.1	10.0	29.0	3.5	−3.1	.006
Height (m)	1.76	0.08	1.65	0.07	−4.8	<.001
Weight (kg)	73.4	13.2	63.9	9.0	−2.8	.008
Body Mass Index (kg/m^2)	23.7	3.9	23.4	2.8	<1	ns
Alcohol intake on a weekend/nonworking day (g)	43.4	40.6	45.9	37.6	<1	ns
Alcohol intake on a working day (g)	26.3	10.0	26.5	17.2	<1	ns
Active smoking (n)	15	46.9%	4	17.4%	7.3	.026
Homosexual orientation (n)	18	56.3%	21	91.3%	8.1	.004

orientation was reported in 56.3% of male-to-females and in 91.3% of female-to-males, $\chi^2(1, n = 54) = 6.12$, $p = .013$. At the time of the interview, there was a significant difference in age between nonhomosexual and homosexual male-to-females (45.6 and 37.5 years, respectively, $t(31) = -2.804$, $p = .009$.

All participants gave written informed consent for participation in this study, approved by the Ethical Committee of the Ghent University Hospital.

Measures

General Health

As sex steroid treatment is known to be associated with several side effects, selected post-surgery data were collected from this sample. Current and past hormonal treatment, smoking and drinking habits, other medical treatment, and general health issues, such as thrombogenic accidents, heart conditions, hypertension, depression, hyperprolactinaemia, thyroid problems, hyperlipidemia, liver function problems, and osteoporosis, were addressed. This information was discussed in detail with the patient, and confirmed by physical examination (e.g., blood pressure), laboratory assessment (e.g., prolactin levels), review of medication intake, and systematic review of the medical records. It is, however, possible that patients gave incorrect information about, for example, use of alcohol and tobacco to present themselves favorably to their clinicians.

Biographical Questionnaire for Transsexuals and Transvestites

Data were derived from an extensive, structured interview (BVT, Biographical Questionnaire for Transsexuals and Transvestites; Verschoor & Poortinga, 1988) in which each question has fixed response categories. This interview is used in all Dutch gender clinics as part of the intake procedure at the initial diagnostic assessment (Doorn, Poortinga, & Verschoor, 1994). This descriptive questionnaire contains items referring to sociodemographic information, gender development during adolescence and adulthood, preadolescent gender behavior, transvestite practice, sexuality, and medical antecedents (250 items). Selected items were reapplied in this study: stable sexual relationship (e.g., "Do you have a stable sexual relationship?"), sex of the partner, sexual satisfaction with the partner, frequency of orgasm (during intercourse), frequency of masturbation, and frequency of sexual arousal. In this way, pre- and posttreatment data

were obtained. Items as start of relationship, duration of relationship, age of partner, sexual satisfaction in general, improvement/worsening of sex life, frequency of orgasm during masturbation, change in orgasmic feelings, lubrication, meeting the expectation of SRS, pain during intercourse, and general satisfaction describing the postsurgical condition were incorporated in a self-developed questionnaire with fixed response categories. If applicable, the categories were quantified from $1 =$ never to $4 = $ (almost) always.

Body Image Scale

The Body Image Scale (BIS; Lindgren & Pauly, 1975), adapted for a Dutch sample by Kuiper (1991), was used. This scale consists of 30 items divided into three subscales: primary, secondary, and neutral sexual characteristics, with higher scores representing more dissatisfaction (5-point category). The internal consistency was good for the versions for both female-to-male and male-to-female transsexuals, with Cronbach's $\alpha = .88$ and .87, respectively.

Satisfaction with the Surgical Results

The satisfaction with mastectomy and phalloplasty or mammoplasty and vaginoplasty was evaluated by the patient on a 5-point rating scale ($1 = $ *very unsatisfied* to $5 = $ *very satisfied*).

Hormone Assays

Following the personal interviews, venous blood was obtained between 08:00 and 12:00 hr after an overnight fast, but because of practical reasons, regardless of the timing of the last administration of the hormonal treatment. This was important in female-to-males in regard to long-acting intramuscular testosterone administration. The sex steroid levels were measured in each participant in order to evaluate these hormones that may affect features of virilization or feminization. The gonadotropin levels were measured to detect more subtle variations in the hypothalamo–pituitary–gonadal axis. To avoid effects of seasonal variation, blood collection was completed in a period of 2 months. Commercial kits for radio immunoassay (RIA) were used to determine the serum concentrations of testosterone (Medgenix Diagnostics, Fleurus, Belgium) and estradiol (Incstar, Stillwater, MM, USA); commercial kits for immuradiometric assays were used for determinations of serum sex hormone binding globulin (SHBG; Orion Diagnostica, Espoo, Finland),

Dehydroepiandrosterone-sulphate (DHEA-S; DSL Inc., Webster, TX), LH (luteinizing hormone), and FSH (follicle stimulating hormone; Medgenix Diagnostics); the latter hormone levels were assessed because of their potential ability to reveal changes in gonadal function (Deslypere et al., 1987). Dihydrotestosterone was assayed by an in-house RIA following chromatographic separation.

Serum-free and bioavailable testosterone (T) and estradiol were calculated from the total serum hormone concentrations, serum SHBG, and serum albumin using a validated equation derived from the mass action law (Vermeulen, Verdonck & Kaufman, 1999).

RESULTS

Physical and Endocrinological Parameters

Female-to-males were significantly shorter, $t(46) = -4.8, p < .001$, and weighed less, $t(46) = -2.8, p = .008$, than male-to-females; results that remained unchanged when correction for age was applied (Table I). Body mass index (BMI) was comparable (23 kg/m^2) in both groups. Alcohol intake was mild and similar in both sexes. Nearly 50% of male-to-females compared to only 20% of female-to-males smoked cigarettes, $\chi^2(1) = 7.3, p = .026$. In this postoperative setting, 72% of male-to-females were on estradiol, whereas others were taking conjugated estrogens ($n = 3$), estradiol–cyproterone acetate ($n = 2$), estrogen–progestagen ($n = 1$), or no hormonal treatment ($n = 1$). One patient suffered a stroke, an absolute contraindication for further estrogen treatment. This patient was not included in further hormonal analysis. Sixty-five percent of female-to-males were treated by intramuscular testosterone and 30% by oral testosterone undecanoate. One female-to-male transsexual was not on androgen treatment because of recurrent liver function problems. He was also excluded from further hormonal analysis.

As expected, there was a significant difference in androgen levels between female-to-males and male-to-females, Mann–Whitney test $U = 0.0, p < .001$ (Table II). Hematocrit, partly reflecting androgen exposure, was significantly higher in female-to-males, $t(46) = 5.9, p < .001$. However, the median testosterone value in this group was low (285.0 ng/dl), with 25% of patients reaching the cut-off value for hypogonadism of 320 ng/dl. Usually testosterone treatment should aim at testosterone concentrations in the mid-normal male testosterone range. LH and FSH levels were 18.4 and 34.0 mU/ml in male-to-females, and 39.2 and 97.0 mU/ml in female-to-males, higher than normal values (1–9

and 1–12, respectively). Although all male-to-females had total testosterone levels within the normal range for non-transsexual women (10–80 ng/dl) because of the estrogen effect on sex hormone binding globulin, only 32.1% reached normal free testosterone levels (0.2–0.5 ng/dl).

Female-to-male patients rarely reported physical co-morbidity. One patient was treated for hypertension and one patient for depression; one patient had Type 1 diabetes and one patient had been diagnosed with Type 2 diabetes. One patient reported liver problems, already present before hormonal treatment. Twenty-one percent of male-to-female patients developed hypertension (>160/95 mmHg) during sex steroid treatment and 14.3% reported having had a prolactin level above the upper limit of normal, which was confirmed by review of medical records. Prolactin levels in all participants were within the normal limits on blood testing at the time of research. Twenty-five percent of male-to-female patients were treated for depression. Hypothyroidism and hyperlipidemia were mentioned by 7.1% of participants, whereas one patient had suffered a stroke. No malignancies were reported. No further abnormalities were observed on the blood examination (data not shown). We are not aware of any death by suicide in the total group of transsexuals since the initiation of our gender team.

Partner Relation Parameters

More often transsexuals had a stable sexual relationship after SRS (52.7%) compared to before (35.3%), $\chi^2(1, n = 51) = 5.06, p = .025$ (Table III). This was particularly the case in male-to-females, $\chi^2(1, n = 32) = 4.08, p = .043$. The female-to-males had more difficulties in starting a new relationship after transition. Between the two groups, there was no difference in having a stable relationship, $\chi^2(1, n = 55) = .37, ns$. Nearly one out of four participants did not have a sexual partner since SRS. Half of the participants were in a relationship before or during transition, whereas the others started a new relationship after surgical reassignment. Before SRS, female-to-males all had sexual partners of the same biological sex, where after SRS one female-to-male chose a male partner. A female partner was chosen by 45.5% of the male-to-females before SRS, whereas after surgery only 26.3% had a female partner, $\chi^2(1, n = 32) = .40, ns$). All partners, except for one partner of a male-to-female transsexual, had been informed about the transsexual past. After SRS, 80% of all participants expressed their satisfaction with their relational and sexual life. In particular, a tendency was noted for more female-to-males to report

Table II. Hormonal Parameters

	Male-to-female (n = 28)	Female-to-male (n = 19)	t or U	p
LH (mU/ml)			4.32	<.001
M	18.4	39.2		
SD	12.2	20.3		
FSH (mU/ml)			5.2	<.001
M	34.0	97.0		
SD	27.5	50.3		
Prolactin (ng/ml)			199.0	.09
Mdn	4.7	6.6		
IQR	3.4–6.9	4.1–9.8		
DHEA-S (μg/dl)			116.0	.001
Mdn	105.5	202.0		
IQR	74.0–165.8	124.0–320.0		
Testosterone (ng/dl)			0.0	<.001
Mdn	18.1	285.0		
IQR	12.4–27.8	155.0–823.0		
Free T (ng/dl)			0.0	<.001
Mdn	0.12	5.7		
IQR	0.1–0.3	3.6–19.4		
SHBG (nmol/l)			34.0	<.001
Mdn	98.6	22.1		
IQR	53.0–195.3	11.4–34.2		
DHT (ng/dl)			20.0	<.001
Mdn	6.8	42.4		
IQR	4.5–8.4	23.9–60.6		
Estradiol (pg/ml)			180.0	.037
Mdn	13.1	20.4		
IQR	9.3–31.0	16.3–32.1		
Hematocrit (%)			5.9	<.001
M	40.2	44.9		
SD	2.6	2.8		

Note. T: testosterone; SHBG: sex hormone binding globulin; DHEA-S: dehydroepiandrosterone-sulphate; DHT: dihydrotestosterone.

sexual satisfaction in a relation after SRS compared to before.

Sexual Satisfaction

A total of 5 (9%) out of 55 participants, 3 male-to-females and 2 female-to-males, reported not having any sexual activity. For those who had sexual activity, 30 (60%) participants were very satisfied with their sex life, 18% remained neutral, and 22% were dissatisfied (single-item measure; Table IV). The participants with a partner were more satisfied with their sex life than those who remained single, $\chi^2(1, n = 55) = 3.61$, $p = .058$. A significant correlation between general and sexual satisfaction was found, $r(49) = .49$, $p < .001$. When evaluating changes in sex life before and after SRS, 75.5% of participants indicated an improvement and 12.3% a worsening. Pain, lack of sensation, and difficulties to relax

were reported in this context. A correlation between the improvement in sex life and the satisfaction with the new primary sex characteristics (scored with BIS) was found, $r(47) = .29$, $p = .043$. This correlation was not found when evaluating satisfaction with the secondary or neutral sexual characteristics. After SRS, the participants were more often sexually excited than before. This difference was only statistically significant in the male-to-females, $\chi^2(1, n = 29) = 5.78$, $p = .016$. The more frequently participants experienced sexual excitement, the more they felt their sexual life had improved, $r(49) = .38$, $p = .007$.

Orgasm

Female-to-male participants masturbated more frequently after SRS compared to before, $\chi^2(1, n = 15) = 5.14$, $p = .023$. Before SRS, there was no difference in frequency of masturbation between the two groups,

Table III. Sexual Relationship Parameters Before and After Sex Reassignment Surgery

	Male-to-female			Female-to-male		
	Before	After	*p*	Before	After	*p*
Stable sexual relationship						
N	32	32		19	23	
%	34.4	59.4	.043	36.8	43.5	*ns*
No sexual partners since SRS						
N		32			23	
%		21.9			30.4	*ns*
Start relationship						
N		19			9	
%	52.6	47.4	*ns*	44.4	55.5	*ns*
Sexual partner (N)	11	19		9	10	
Man (%)	54.5	73.7		0.0	10.0	
Woman (%)	45.5	26.3	*ns*	100.0	90.0	*ns*
Sexual satisfaction with partner (N)	9	19		6	11	
(Very) satisfied (%)	77.7	78.9		50.0	81.9	
Neutral–(very) unsatisfied (%)	22.2	21.0	*ns*	50.0	18.1	*ns*
Frequency orgasm in sexual intercourse (N)	24	28		11	18	
(Almost) always (%)	41.7	50.0		45.5	77.8	
Never–sometimes (%)	58.3	50.0	*ns*	55.5	22.2	*ns*

Note. *p* value of difference before and after SRS, McNemar test; for χ^2 test between-group differences after SRS.

Table IV. Sex Life Before and After SRS

	Male-to-female			Female-to-male		
	Before	After	*p*	Before	After	*p*
Sexual satisfaction (N)		29			21	
Satisfied (%)		48.3			76.2	
Neutral (%)		27.5			4.8	
Unsatisfied (%)		24.2			19.0	
Comparison of sex life (N)		29			21	
Improvement (%)		75.8			75.0	
Unchanged (%)		10.3			15.0	
Worsening (%)		13.8			10.0	
Sexual arousal (N)	29	32		15	23	
(Very) often (%)	17.2	46.9		40.0	60.9	
Never–sometimes (%)	82.8	53.1	.016	60.0	39.1	*ns*
Frequency masturbation (N)	29	31		15	23	
(Very) often (%)	34.5	32.3		20.0	78.3	
Never–sometimes (%)	65.5	67.7	*ns*	80.0	21.7	.023
Orgasm during masturbation (N)		23			19	
(Almost) always (%)		65.2			94.7	
Never–sometimes (%)		33.8			5.3	
Change in orgasmic feelings (%)		79.2		73.7		
Secretion during excitement (%)		64.3				
Secretion during orgasm (%)		76.0				

Note. *p* value of difference before and after SRS, McNemar test; χ^2 test for between-group differences after SRS.

Table V. Satisfaction with Surgical Results (%)

	Male-to-female		Female-to-male	
	Breast augmentation ($n = 21$)	Vaginoplasty ($n = 29$)	Mastectomy ($n = 14$)	Phalloplasty ($n = 19$)
Very satisfied	66.6	48.3	35.7	33.3
Satisfied	28.6	37.9	42.8	55.5
Neutral	4.8	10.3	21.4	11.1
Unsatisfied	0.0	0.0	0.0	0.0
Very unsatisfied	0.0	3.4	0.0	0.0

whereas after surgery, the female-to-males masturbated more, $\chi^2(1, n = 54) = 14.19, p = .007$, regardless of having a partner. Seventy-eight percent of the total group was able to reach an orgasm through masturbation. No significant difference was found between female-to-males and male-to-females regarding the ability to reach orgasm during sexual activity with their partner, $\chi^2(1, n = 46) = 1.07, ns$ (Table III). In our experience, female-to-males' sexual activity preoperatively involved clitoral stimulation rather than vaginal intercourse, whereas following phalloplasty it referred mostly to intercourse with their new penis. On the other hand, in male-to-females preoperative sexual activity occurred through vaginal and anal penetration, and postoperatively mostly by vaginal intercourse.

The majority of the male-to-females and the female-to-males reported changes in their orgasmic feelings. These feelings changed in both groups: a more powerful and shorter orgasm for the female-to-males, and a more intense, smoother and longer orgasm for the male-to-females. More than two-thirds of the male-to-females reported the secretion of a fluid in the neovagina, not only during orgasm but also during sexual excitation.

Expectations

The transsexual persons' expectations (both in female-to-males and male-to-females) were met on the physical, emotional, and social level and less on the sexual level, with satisfaction rates of 81.5, 94.4, 90.7, and 66.7%, respectively.

Surgical Parameters

Most participants were very satisfied with the mammoplasty and vaginoplasty, except for one female with a shallow vagina, rendering intercourse difficult (Table V). There was a correlation between satisfaction with vaginoplasty and sexual life, $r(26) = .43, p = .029$.

This correlation was not found for breast augmentation alone. Most female-to-males expressed their satisfaction with the mastectomy and the phalloplasty. Nobody was disappointed and two participants remained neutral. One patient suffered a partial necrosis of the neophallus and mild urinary incontinence was the problem in another man. A correlation for the female-to-males between satisfaction with sex life and satisfaction with the surgical results was seen, especially regarding the phalloplasty, $r(17) = .68, p = .003$.

Table VI shows the comparison on several sexual items between the female-to-male patients with an erection prosthesis and those without it. Most participants without prosthesis were considering having one in the future. As the number of participants was too small for further statistical testing, we could only notice the following trend. In female-to-males with prosthesis, sexual expectations were more realized. They had more sexual

Table VI. Female-to-Males with and Without Erection Prosthesis (%)

	With prosthesis, ($n = 12$)	Without prosthesis, ($n = 10$)
(Nearly) totally realization of expectation	83.3	60.0
More than one partner since SRS	66.7	40.0
Stable sexual relationship	50.0	40.0
(Very) satisfied with sex life	75.0	77.8
Improvement of sex life	83.3	62.5
Sexuality is (very) important	91.7	50.0
(Very) often excited sexually	58.3	60.0
Often preoccupied with provoking sexual fantasies	50.0	13.5
Often (from several times/week until 1 time/month) masturbation	91.7	80.0
(Mostly) always orgasm during masturbation	90.9	100.0
(Mostly) always orgasm during intercourse	60.0	100.0
Never pain during intercourse	44.5	100.0

partners and experienced a considerable improvement of their sex life since SRS. Sexuality was a more important aspect of life, and they were more often preoccupied with sex. Nevertheless, both groups expressed the same degree of sexual satisfaction. Transsexuals with a prosthesis more often experienced pain during intercourse and possibly therefore were less able to reach orgasm during intercourse.

DISCUSSION

The purposes of this study were to describe our specific hormonal treatment regimen, to explain the rationale behind it, to evaluate its long-term safety and, to evaluate sexual health in postoperative transsexual patients.

Contrary to the usual practice, whereby an inclination to maximize hormone dosage by patients as well as physicians is seen, our gender team has always treated patients by a mild dual-model hormonal scheme, aiming at no or minimal side effects. We believe that pharmacological ablation of endogenous sex steroid production prior to the initiation of exogenous cross-sex steroid treatment may be advisable, in order to reduce dosage of administered hormones and thus morbidity. One could expect that a lower dose of cross-sex hormones may then be sufficient because of increased sensitivity of tissues. Administration of estrogens alone will suppress gonadotropin output and by consequence androgen production, but dual therapy with one compound that suppresses androgen secretion or action and a second compound that supplies estrogen is likely to be more effective (T'Sjoen, Rubens, De Sutter, & Gooren, 2004). Of course, these ideas need systematic clinical trials in order to find an ideal treatment, where tailoring for the individual patient will still be necessary. In this study, it was shown that male-to-females reported more frequently a decrease in libido. We recommended they would start hormonal therapy with antiandrogens to let them adapt to low testosterone levels. This phase may prove to be an extra diagnostic test. It is remarkable that in postoperative male-to-females only a minority reached normal free testosterone levels (reference range for women). It may be that male-to-females need a small amount of androgens to be libidinous, as is suggested for women with hypoactive sexual desire disorder (Laughlin, Barrett-Connor, Kritz-Silverstein, & von Muhlen, 2000).

Relatively few and minor morbidities were observed in our patient group that were mostly reversible with appropriate treatment, possibly in part related to response bias. A trend toward more general health problems in male-to-females was seen, which could be explained by the older age and smoking habits of this group. The number of complications reported here was markedly lower than those described by the Amsterdam group, who reported on a much larger group of transsexual patients (van Kesteren et al., 1997). Our treatment schedule of cross-sex hormones is acceptably safe and has some tentative management and diagnostic implications for the hormonal treatment of transsexual persons. The low testosterone values found in female-to-males in our study can be explained by the fact that blood sampling was performed regardless of the moment of the last administration of the hormonal treatment; however, the high gonadotropin levels that were measured led us to optimally adjust the testosterone dosage.

In accordance with other studies, our data showed that male-to-females were significantly older than female-to-males. The age difference at time of SRS could be related to the fact that 43.7% of our male-to-female patients was nonhomosexual compared to 8.6% of our female-to-males patients. This finding is further supported by the age difference between homosexual and nonhomosexual male-to-females at the time of the interview. It is known from other studies that the nonhomosexual natal male patients are significantly older at time of evaluation as well as at time of SRS (Blanchard, Steiner, Clemmensen, & Dickey, 1989).

Female-to-males had more difficulties in establishing a stable relationship after transition. One-third of the female-to-males did not have any sexual partner after transition although libido was not impaired. Despite their masculine presentation and their masculine sex organs, some avoided a relationship with a potential partner, because they felt uncertain and anxious about their maleness. If transsexual patients are able to establish a stable relationship, they are sexually very satisfied, which in turn improves their general satisfaction. In contrast with the data of some researchers (Bodlund & Kullgren, 1996), who reported that male-to-females have, after transition, more frequently a new partner whereas the female-to-males tend to remain with the same partner, we observed no significant difference between the two groups. It is remarked that not all transsexual patients wish to inform their new partners about their natal sex. In a small, dense country as Belgium it is very difficult to hide one's transsexual past. We always give the advice to patients to inform their partners about their past. Mostly this has a positive effect on the relationship.

After surgery, more male-to-females acted upon their attraction to men, as a male sex partner was more often preferred. Daskalos (1998) suggested that male-to-females conform before SRS regarding their sexual orientation and choose a female partner, but we can

assume that some conform after SRS (and then choose a male partner). From the 19 male-to-females who had a male partner after SRS, only 14 reported being exclusively orientated to men. On the other hand, the male-to-female participants who defined themselves as homosexual before sex reassignment more often had a stable relationship after SRS than the nonhomosexual male-to-females, but this difference was not significant (70.6% vs. 46.6%). A question to resolve is if the self-definition of sexual orientation is a reliable measure. Lawrence, Latty, Chivers, and Bailey (2005) questioned reported changes in sexual orientation by examining sexual arousal in male-to-female transsexuals by vaginal photoplethysmography.

In general, most transsexual individuals indicated an improvement in their sex life and more sexual excitement after SRS. Most participants were able to reach orgasm both through masturbation and intercourse. Before surgery, they experienced their body as strange and not belonging to themselves. Often they did not accept being touched by anybody (even by themselves). They were not preoccupied by sex, but were preoccupied by getting rid of the unwanted sex organs. After SRS, sexuality can only improve, on condition they have the right body, with the right genitals. Our data showed that an improvement of sex life and sexual satisfaction was correlated with the satisfaction with the surgical results and the new primary sex characteristics. A correlation between sexual functioning and the anatomy of the neovagina or neophallus has been described (Green, 1998). A dysfunctional vagina is often a reason for sexual dissatisfaction in male-to-females. The phalloplasty surgery appears to be crucial in increasing the body image satisfaction. However, if the surgical results are not optimal, this may actually increase sexual dissatisfaction.

Although the effect of relief of gender dysphoria after SRS is the same for both groups, we noticed a difference regarding some aspects of sexual life. Female-to-males masturbated more frequently (more than before SRS and more than male-to-females), and a trend toward increased arousal and easily reached orgasm (during intercourse as well as when masturbating) was reported. A study with a larger number of participants may clarify these trends. A possible explanation for these group differences may be that before transition, female-to-males suffer even more from gender dysphoria, derived from the younger age at which they seek sex-reassignment. Also, male hormones influence sexual behavior and libido (Mooradian, Morley, & Korenman, 1987). The absence of testosterone possibly explains the effect on the sexual satisfaction rate of the male-to-females, where one out of four remained unsatisfied. Male-to-female transsexuals have to deal with the absence of testosterone, whereas female-to-male transsexuals have to experience the presence of markedly higher androgen levels after SRS, compared to the initial hormonal treatment phase.

A retrospective finding of the current study is the experience of orgasm changes: a female orgasm pattern for the male-to-females and a male orgasm pattern for the female-to-males. This was also reported earlier by Rehman, Lazer, Benet, Schaefer, & Melman (1999).

More than two-thirds of the male-to-females reported the secretion of a vaginal fluid during sexual excitation and during orgasm. The hypothesis is that during sexual excitation this fluid is produced in Cowper's glands (in natal males it is called the preejaculatory penile secretion) whereas during orgasm it originates from the prostate. Cowper's glands are situated in the urogenital diaphragm, beneath the prostate gland, and are not removed during genital surgery. We expect that the production of this fluid will decrease in the absence of androgens or by the administration of estrogens, but further study is necessary. Details are lacking on the nature of the hormonal control of these glands. It is clear from studies on castration that there is a dependence on the testes. Some early studies have addressed the action of estrogens on the accessory genital organs in a variety of animals; these reports were almost exclusively on morphological findings. It was concluded that a small supply of estrogen appears to be favorable for the well-being of the male accessory reproductive organs (Raeside, Christie, & Renaud, 1999). Informing the postoperative transsexual of the continuation of the fluid production is useful. The spontaneous lubrification can create more comfort in the sexual relationship.

Some female-to-male transsexuals did not choose for an erection prosthesis. They were satisfied with phalloplasty alone, and did not wish further surgical interventions. In the group with penile prosthesis, sexual expectations were more realized, but more often pain during intercourse was experienced. During phalloplasty, the free forearm flap is connected with two nerves, one of two dorsal clitoral nerves for erogenous sensation and the ileoinguinal nerve for proprioception (the ability to sense the position, location, orientation, and movement of a body part). Probably this proprioceptive sensation during intercourse is responsible for the pain; however, it has a protective function against perforation of the prosthesis (Hoebeke, De Cuypere, Ceulemans, & Monstrey, 2003). Pain may also be explained by an exaggerated pressure of the erection prosthesis on the free forearm flap or by irritation of the pubic bone at the place of fixation.

The response rate remains a difficult problem in this type of follow-up research. The patients are either difficult to trace because of the frequent change of residence, or because of unwillingness to participate in interviews of this kind. This implies that researchers can never obtain the profiles of those who fail to respond. This selection bias cannot be avoided. The longer the postoperative period, the lower a response rate will be. The response-rate in the Blanchard et al. (1989) sample was 84.1% with a mean follow-up interval of 4.4 years. Pfäfflin and Junge (1990) reported a response rate of 63% after 5.1 years for male-to-female and 6.7 years for female-to-male transsexuals. Nearly 80% of the population in Smith's (2002) study agreed to cooperate with a mean delay of 22 months. The study of Lawrence (2003) had a 43% response rate, which was comparable to our study (51.3%). A possible explanation for the rather low response rate in the current study could be that all participants were required to be seen on a face-to-face basis, involving an outpatient visit. Other limitations of this research are that data were based on self-reports and thus are subjective. However, the evaluation of SRS can be made mainly on the basis of such subjective data, as SRS is intended to solve a problem that cannot be determined objectively (Lawrence, 2003).

It is clear that the significance and the importance of sexuality have undergone an evolution in our study group. Consequently, we feel that during the preoperative period more attention should be paid to sexual expectations and to possible sexual changes, in order to help the patients cope with these new sensations. Systematic investigation on a larger number of patients is certainly needed to gain more insight into sexual functioning of postoperative transsexuals. A prospective study is needed in male-to-females to further investigate the relation between libido and (subnormal) testosterone levels.

ACKNOWLEDGMENTS

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