

ORIGINAL RESEARCH—INTERSEX AND GENDER IDENTITY DISORDERS

Puberty Suppression in Adolescents With Gender Identity Disorder: A Prospective Follow-Up Study

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ABSTRACT

Introduction. Puberty suppression by means of gonadotropin-releasing hormone analogues (GnRHa) is used for young transsexuals between 12 and 16 years of age. The purpose of this intervention is to relieve the suffering caused by the development of secondary sex characteristics and to provide time to make a balanced decision regarding actual gender reassignment.

Aim. To compare psychological functioning and gender dysphoria before and after puberty suppression in gender dysphoric adolescents.

Methods. Of the first 70 eligible candidates who received puberty suppression between 2000 and 2008, psychological functioning and gender dysphoria were assessed twice: at T0, when attending the gender identity clinic, before the start of GnRHa; and at T1, shortly before the start of cross-sex hormone treatment.

Main Outcome Measures. Behavioral and emotional problems (Child Behavior Checklist and the Youth-Self Report), depressive symptoms (Beck Depression Inventory), anxiety and anger (the Spielberger Trait Anxiety and Anger Scales), general functioning (the clinician's rated Children's Global Assessment Scale), gender dysphoria (the Utrecht Gender Dysphoria Scale), and body satisfaction (the Body Image Scale) were assessed.

Results. Behavioral and emotional problems and depressive symptoms decreased, while general functioning improved significantly during puberty suppression. Feelings of anxiety and anger did not change between T0 and T1. While changes over time were equal for both sexes, compared with natal males, natal females were older when they started puberty suppression and showed more problem behavior at both T0 and T1. Gender dysphoria and body satisfaction did not change between T0 and T1. No adolescent withdrew from puberty suppression, and all started cross-sex hormone treatment, the first step of actual gender reassignment.

Conclusion. Puberty suppression may be considered a valuable contribution in the clinical management of gender dysphoria in adolescents. **de Vries ALC, Steensma TD, Doreleijers TAH, and Cohen-Kettenis PT. Puberty suppression in adolescents with gender identity disorder: A prospective follow-up study. J Sex Med 2011;8:2276–2283.**

Key Words. Gender Identity Disorder; Transsexualism; Puberty Suppression; Gonadotropin-Releasing Hormone Analogues; Adolescents

Introduction

In recent years, the possibility of puberty suppression has generated a new dimension to clinical management of adolescents with a gender

identity disorder (GID), the official diagnosis according to the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (DSM-IV-TR) [1]. GID is characterized by feelings of gender dysphoria associated with strong

cross-gender identification as well as a persistent discomfort with one's natal sex. The most extreme form of GID, for which the term *transsexualism* is used in the International Classification of Diseases, Tenth Edition (ICD-10) [2], is accompanied by a strong wish for gender reassignment (GR). Gender dysphoria will remit in most prepubertal children with GID (e.g., references [3–6]), but not in most gender dysphoric adolescents [7,8]. Previous studies on the effectiveness of GR, starting with cross-sex hormone (CSH) treatment between the ages of 16 and 18, showed that the gender dysphoria had dissipated, 1 year or more after GR surgery and that psychological and social functioning of these young transsexuals was favorable [7,8]. Age 16 was chosen because some cognitive and emotional maturation is desirable when starting partially irreversible interventions and Dutch adolescents are legally competent to make a medical decision without parents' consent. However, as secondary sex characteristics develop before the age of 16, waiting for medical interventions is highly upsetting for most younger adolescents.

By prescribing gonadotropin-releasing hormone analogues (GnRHa), we enable gender dysphoric adolescents under the age of 16 to explore their gender dysphoria and the wish for GR without the distress of physical puberty development [9]. If an adolescent continues to pursue GR, arresting the development of secondary sex characteristics results in a lifelong advantage of a convincing physical appearance congruent with the desired gender role. Puberty suppression is fully reversible and can be discontinued should the adolescent decide not to pursue GR [10]. It is meant to prevent the emotional problems many young transsexuals experience when puberty has started [11,12]. While on GnRHa, a gender role change is not required, as no physical cross-gender characteristics develop yet. At the Amsterdam gender identity clinic, adolescents are eligible for puberty suppression when they are diagnosed with GID, have shown persistent gender dysphoria since childhood, live in a supportive environment, and have no serious comorbid psychiatric disorders that may interfere with the diagnostic assessment. For example, it can be complicated to disentangle whether the gender dysphoria evolves from a general feeling of being just "different" or a whether a true "core" cross-gender identity exists in adolescents who suffer from an autistic spectrum disorder [13]. In addition, adolescents should have physical changes of puberty to at least Tanner stage 2–3, confirmed by pubertal hormonal levels,

so that they have experienced some of their biological puberty [14–16].

GR commences with the partially irreversible CSH treatment. CSH may be prescribed when adolescents reach the age of 16 and fulfill the same eligibility criteria as for puberty suppression, with the exception of the Tanner stage criterion. The irreversible step of GR surgery is not performed prior to legal adulthood, at the age of 18.

Although some gender identity clinics have adopted this strategy of puberty suppression for adolescents with GID, other professionals working with gender dysphoric youth remain critical (e.g., Viner et al. [17]). They are concerned that GnRHa may be physically hazardous for adolescents and that psychological functioning may be negatively affected by suppressing puberty. Furthermore, they state that one's gender identity is still subject to change during adolescence and that adolescents are therefore unable to make decisions regarding GR.

Aims

Thus far, no studies have been performed that compare psychological functioning and gender dysphoria before and after the start of GnRHa. This prospective follow-up study assessed psychological functioning and gender dysphoria of the first 70 puberty suppressed young transsexuals before and after the start of puberty suppression.

Methods

Participants

Between 2000 and 2008, 140 of 196 consecutively referred adolescents were considered eligible for medical intervention at the Amsterdam gender identity clinic of the VU university medical center (VUmc) (for a description of the protocol, see Delemarre-van de Waal and Cohen-Kettenis [15]). The 29 adolescents who were age 16 years or older were prescribed CSH. The other 111 adolescents were prescribed GnRHa to suppress puberty. Participants of this study were the first 70 adolescents (mean age at assessment 13.6 [standard deviation {SD} = 1.8] years, 33 natal males and 37 natal females), who had subsequently started CSH treatment between the years 2003 and 2009.

Mean ages of the participants at first assessment, at the start of GnRHa treatment and at the start of CSH are presented in Table 1. Table 1 further shows participants' intelligence, as measured by either the Wechsler Intelligence Scale for Children, revised or

Table 1 General characteristics

Variable	All participants (N = 70)	Natal males (N = 33)	Natal females (N = 37)	<i>t</i> or χ^2	<i>df</i>	<i>P</i>
Age (in years)						
At assessment						
<i>M</i> (<i>SD</i>)	13.65 (1.85)	13.14 (1.55)	14.10 (1.99)	−2.24	66.82	0.028*
Range	11.1–17.0	11.1–16.8	11.2–17.0			
At start GnRHa [†]						
<i>M</i> (<i>SD</i>)	14.75 (1.92)	14.25 (1.79)	15.21 (1.95)	−2.14	67.93	0.036*
Range	11.3–18.6	11.6–17.9	11.5–18.6			
At start CSH [‡]						
<i>M</i> (<i>SD</i>)	16.64 (1.90)	16.24 (1.21)	16.99 (1.07)	−2.73	64.22	0.008*
Range	13.9–19.2	13.9–18.9	15.9–19.3			
Time between start GnRHa and CSH						
<i>M</i> (<i>SD</i>)	1.88 (1.05)	1.99 (0.94)	1.78 (1.16)	0.838	67.41	0.405
Range	0.42–5.06					
Full-Scale IQ						
<i>M</i> (<i>SD</i>)	98.2 (15.0)	97.1 (13.3)	99.2 (15.2)	−0.60	63.81	0.55
Range	70–131	70–123	72–131			
Parents' marital status N, (%)						
Both parents [§]	44 (62.9)	23 (69.7)	21 (56.8)	1.25	1	0.26
Other	26 (37.1)	10 (30.3)	16 (43.2)			
Parents' educational level , N (%)						
High	7 (10.6)	1 (3.3)	6 (16.7)	3.75	2	0.15
Middle	44 (66.7)	23 (76.7)	21 (58.3)			
Low	15 (22.7)	6 (20.0)	9 (25.0)			
Sexually attracted to, N (%)						
Own natal sex**	62 (88.6)	29 (87.9)	33 (89.2)	2.70	3	0.44
Both sexes	6 (8.6)	2 (6.1)	4 (10.8)			
Other ^{††}	2 (2.8)	2 (6.0)	0			

*Significant difference in mean age between natal males and natal females, $P < 0.05$.

[†]Gonadotropin-releasing hormone analogues.

[‡]Cross sex hormones.

[§]For marital status, the category "Both parents" included "adopted" ($n = 2$, 2.9%).

^{||}Parents' educational level was measured by a 5-point scale where 1 = *university degree* and 5 = *grade 6 or less*. Education level was divided in three groups; 1 = high, 2 and 3 = middle, and 4 and 5 = low.

**Sexual attraction was coded as "attracted to own natal sex" when adolescents responded that they fell in love "only with boys or only with girls" or "mainly with boys or mainly with girls" (according to their natal sex) and as "attracted to both sexes" when their response was "somewhat more with boys or somewhat more girls" or "both with boys and girls."

^{††}The category "Other" consisted of one natal male who responded "only with girls" and one adolescent who responded "don't know yet." [Correction added after online publication 14-Jul-2010: "only with boys" has been changed to "only with girls".]

M = mean; *SD* = standard deviation.

third edition, or the Wechsler Adult Intelligence Scale, third edition, depending on age and year of assessment [18–20], marital status and educational level of the parents. Compared with natal males, the age of natal females was significantly higher at the time of first assessment, at the start of treatment with GnRHa, and at the start of treatment with CSH. Significant differences between natal males and natal females regarding IQ, marital status, and educational level of the parents were not observed.

Participants' sexual orientation at T1 is also presented in Table 1. Understandably, at T0, quite a few could not report on their sexual orientation because they sometimes were not older than 11 or 12 years. At T1, adolescents answered to the question, "Do you know if you fall in love with girls or boys?" Response categories were "only with boys, mainly with boys, somewhat more with boys, both with boys and girls, somewhat more with girls, mainly with girls, only with girls, or don't know yet". Participants were coded as "attracted to own natal sex" when their

answer was "only with boys or only with girls" or "mainly with boys or mainly with girls" (according to their natal sex) and as "attracted to both sexes" when their answer was "somewhat more with boys or girls" or "both with boys and girls." One natal male responded to the question with "only with boys" and one adolescent with "don't know yet." Separate results for both sexes are presented in Table 1.

When attending the clinic for the first time, the participants were not yet consistently and officially living in the cross-gender role (e.g., using a new first name). However, many were already seen and treated by their families and friends as a member of the other gender. During the diagnostic phase, which usually takes between half a year and a year, all but one made a more official transition. They adopted a new first name and asked their social environment (family, friends, school) to use the appropriate personal pronouns. A legal gender change could, of course, only be made after surgery at age 18.

Procedure

Participants were assessed twice: first, shortly after their attendance at the gender identity clinic (T0); and second, shortly before starting CSH treatment (T1). Both assessments were part of the diagnostic procedure during which eligibility is assessed for puberty suppression and CSH treatment.

The VUmc medical ethics committee approved the study, and all participants and their parents gave informed consent.

Main Outcome Measures

Psychological Functioning

Behavioral and emotional problems were measured by the Child Behavior Checklist (CBCL) and the Youth Self-Report (YSR) administered to the parents and the adolescents, respectively [21,22]. These are widely used questionnaires, assessing a broad range of behavioral and emotional problems, with good psychometric properties. In this study, *T*-scores and percentages in the clinical range were used for total problem behavior, internalizing and externalizing behavior. A *T*-score above 63 is considered to be in the clinical range. Of the Dutch adolescent norm group, the percentage scoring in the clinical range on the total problem score is 8–9% on both the CBCL and YSR [21,22]. Because the CBCL and YSR were intended to measure general behavior disturbance and not gender dysphoria (which was measured by other means), items referring to gender atypical behavior were scored as 0 for all the analyses in this study to avoid any artificial inflation (for a full description of the items that may refer to gender dysphoric behavior, see Cohen-Kettenis et al. [23]).

In addition, the adolescents completed the Beck Depression Inventory (BDI). This is a 21-item inventory in multiple-choice format measuring presence and degree of depression in adolescents and adults, with good psychometric properties [24]. The BDI-II has been developed to assess a depression. A score between 14 and 19 is suggestive of a mild depression, a score between 20 and 28 of a moderate depression, and a score of more than 29 of a severe depression. Furthermore, the Trait Anger and Anxiety (TPI and STAI, respectively) Scales of the State-Trait Personality Inventory were administered [25,26]. Only the “trait” versions were used, assessing the tendency to respond with anxiety or anger to a threatening or annoying situation, respectively. They each

contain 20 statements concerning the frequency with which the emotions of anger and anxiety are experienced. Each response can range from 1 (*almost never*) to 4 (*almost always*). Total scores are often used to assess and evaluate feelings of anxiety and anger over time. Finally, the attending clinician rated the Children’s Global Assessment Scale (CGAS), one of the most widely used measures of the overall severity of disturbance in children [27].

An official Dutch version of each of these instruments was available and used in this study.

Gender Dysphoria

The Utrecht Gender Dysphoria Scale (UGS) was used to measure adolescents’ gender dysphoria. This is a 12 item questionnaire on which the subject rates his or her agreement on a 5-point scale. An example of an item is “I feel a continuous desire to be treated as a man/woman.” The higher the score, the more gender dysphoria is indicated (for psychometric data, see Cohen-Kettenis and van Goozen [7]). In addition, the Body Image Scale (BIS) was administered to measure body satisfaction [28]. The scale consists of 30 body features, which the subject is asked to rate on a 5-point scale. Each of the 30 items falls into one of three basic groups based on its relative importance as a gender-defining body feature: primary sex characteristics, secondary sex characteristics, and neutral body characteristics. A higher score indicates more dissatisfaction. For this study, an adaptation for the Dutch population was used [29].

Statistical Analyses

Independent *t*-tests and Chi-square tests were used to ascertain differences between natal males and females.

Repeated-measures analysis of variance (ANOVA) was used to ascertain within-subject differences between baseline functioning (T0, before the start of GnRHa) and the start of CSH (T1), with sex entered as a between-subject variable.

Not all 70 adolescents completed both assessments, for example, because some lists were added to the test battery after the first eligible adolescents had started GnRHa. Only data of adolescents who administered questionnaires on both assessments could be used (CBCL, YSR: 54; BDI, TPI, STAI, CGAS, and UGS: 41; BIS: 57). Independent *t*-tests between mean scores on the CBCL, YSR, BDI, TPI, STAI, CGAS, UGS, and BIS of adolescents who completed both assess-

ments and mean scores of adolescents who completed only one of the assessments revealed no significant differences on all used measures, neither at T0 nor at T1.

Results

Psychological Functioning

Adolescents showed a significant decrease in behavioral and emotional problems over time on mean *T*-scores of the total problem scale, the internalizing and externalizing scale of both CBCL and YSR (see Table 2). In addition, the percentage of adolescents scoring in the clinical range significantly decreased between T0 and T1, on the CBCL total problem scale (44.4% vs. 22.2%, $\chi^2[1] = 6.00$, $P = 0.001$), and the internalizing scale (29.6% vs. 11.1%, $\chi^2[1] = 5.71$, $P = 0.017$) of the YSR. Depressive symptom scores on the BDI-II significantly decreased and global functioning ratings on the CGAS significantly increased between T0 and T1 (see Table 2). No significant change was observed in mean TPI or STAI scores over time, representing feelings of anger and anxiety, respectively (see Table 2).

With regard to sex differences, natal females showed significantly more problem behavior at T0 and T1 than natal males in mean externalizing *T*-scores of the CBCL and the YSR (see Table 2). In addition, compared with natal males, natal females reported significantly more feelings of anger and anxiety and had a significantly lower score on the global assessment of functioning scale at T0 and T1 (see Table 2).

There was no significant interaction effect between natal sex and time for any of the used measures.

Gender Dysphoria

No significant changes in gender dysphoria or body image scores between T0 and T1 emerged (see Table 3). Compared with natal males, natal females reported significantly more gender dysphoria and were more dissatisfied with their primary and secondary sex characteristics both at T0 and T1 (see Table 3). There was a significant interaction effect between natal sex and the changes of gender dysphoria between T0 and T1; natal females became more dissatisfied with their secondary ($F[1,55] = 14.59$, $P < 0.001$) and neutral ($F[1,55] = 15.26$, $P < 0.001$) sex characteristics compared with natal males.

Table 2 Psychological functioning of adolescents with gender dysphoria before (T0) and while on puberty suppression (T1)

	T0			T1			T0-T1 significance		Between-sex significance	
	All	Natal males	Natal females	All	Natal males	Natal females	<i>F</i> (df, errdf.)	<i>P</i>	<i>F</i> (df, errdf.)	<i>P</i>
	<i>M</i> (SD)	<i>M</i> (SD)	<i>M</i> (SD)	<i>M</i> (SD)	<i>M</i> (SD)	<i>M</i> (SD)				
CBCL (N = 54)										
Total <i>T</i> -score	60.70 (12.76)	59.42 (11.78)	61.73 (13.60)	54.46 (11.23)	50.38 (10.57)	57.73 (10.82)	26.17 (1.52)	<0.001	2.64 (1.52)	0.110
Internalizing <i>T</i> -score	61.00 (12.21)	60.00 (9.51)	61.80 (14.12)	54.46 (10.22)	52.17 (9.81)	56.30 (10.33)	22.93 (1.52)	<0.001	1.16 (1.52)	0.286
Externalizing <i>T</i> -score	58.04 (12.99)	54.71 (12.91)	60.70 (12.64)	53.81 (11.86)	48.75 (10.22)	57.87 (11.66)	12.04 (1.52)	0.001	6.29 (1.52)	0.015
YSR (N = 54)										
Total <i>T</i> -score	55.46 (11.56)	53.56 (12.26)	57.10 (10.87)	50.00 (10.56)	47.84 (10.86)	51.86 (10.11)	16.24 (1.52)	<0.001	1.99 (1.52)	0.164
Internalizing <i>T</i> -score	56.04 (12.49)	55.88 (11.81)	56.17 (13.25)	49.78 (11.63)	49.24 (12.24)	50.24 (11.28)	15.05 (1.52)	<0.001	0.049 (1.52)	0.825
Externalizing <i>T</i> -score	53.30 (11.87)	48.72 (11.83)	57.24 (10.59)	49.98 (9.35)	46.52 (9.23)	52.97 (8.51)	7.26 (1.52)	0.009	9.14 (1.52)	0.004
Depression (BDI) (N = 41)	8.31 (7.12)	5.71 (4.31)	10.34 (8.24)	4.95 (6.72)	3.50 (4.58)	6.09 (7.93)	9.28 (1.39)	0.004	3.85 (1.39)	0.057
Trait anger (TPI) (N = 41)	18.29 (5.54)	5.22 (2.76)	6.43 (2.78)	17.88 (5.24)	5.00 (3.07)	6.39 (2.59)	0.46 (1.39)	0.503	5.70 (1.39)	0.022
Trait anxiety (STAI) (N = 41)	39.43 (10.07)	4.33 (2.68)	7.00 (2.36)	37.95 (9.38)	4.39 (2.64)	6.17 (2.62)	1.21 (1.39)	0.276	16.07 (1.39)	<0.001
Global functioning (CGAS) (N = 41)	70.24 (10.12)	73.10 (8.44)	67.25 (11.06)	73.90 (9.63)	77.33 (8.69)	70.30 (9.44)	8.76 (1.39)	0.005	5.77 (1.39)	0.021

M = mean; *SD* = standard deviation; CBCL = Child Behavior Checklist; YSR = Youth Self Report; BDI = Beck Depression Inventory; TPI = Spielberger's Trait Anger Scale; STAI = Spielberger's Trait Anxiety Scale; CGAS = Children's Global Assessment Scale; df = degrees of freedom.

Table 3 Gender dysphoria of adolescents with gender dysphoria before (T0) and while on puberty suppression (T1)

	T0				T1				T0-T1 significance		Between-sex significance	
	All	Natal males	Natal females	All	Natal males	Natal females	All		F (df, errdf)	p	F (df, errdf)	P
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)					
Gender dysphoria scale (UGDS) (N = 41)	53.20 (7.91)	47.95 (9.70)	56.57 (3.89)	53.9 (17.42)	49.67 (9.47)	56.62 (4.00)		0.959 (1,39)	0.333		15.98 (1,39)	<0.001
Body image (BIS) (N = 57)												
Primary sex characteristics	4.10 (0.56)	4.02 (0.61)	4.16 (0.52)	3.98 (0.71)	3.74 (0.78)	4.17 (0.58)		2.18 (1,55)	0.145		4.11 (1,55)	0.047
Secondary sex characteristics	2.74 (0.65)	2.66 (0.50)	2.81 (0.76)	2.82 (0.68)	2.39 (0.69)	3.18 (0.42)		0.327 (1,55)	0.569		11.57 (1,55)	0.001
Neutral characteristics	2.41 (0.63)	2.60 (0.58)	2.24 (0.62)	2.47 (0.56)	2.32 (0.59)	2.61 (0.50)		0.248 (1,55)	0.620		0.081 (1,55)	0.777

M = mean; SD = standard deviation; UGDS = Utrecht Gender Dysphoria Scale; BIS: Body Image Scale; df = degrees of freedom.

Discussion

This is the first prospective study showing that psychological functioning of adolescents diagnosed with GID had improved in many respects after an average of nearly 2 years of GnRHa use. Adolescents showed fewer behavioral and emotional problems, reported fewer depressive symptoms, feelings of anxiety and anger remained stable, and their general functioning improved.

There may be various explanations for these results. Foremost, suppression of the development of secondary sex characteristics resulted in a physical appearance allowing for a smooth transition into the desired gender role. In adult transsexuals, postoperative psychopathology is associated with difficulties in passing in their new gender [30]. Furthermore, by receiving puberty suppression, gender dysphoric adolescents may trust that GR will be offered if needed. In addition, stigmatization and discrimination (e.g., references [11,31].) may have been limited because the adolescents in this study received extensive family or other social support. Finally, the adolescents were all regularly seen by one of the clinic's psychologists or psychiatrists. Psychological or social problems could thus be timely addressed. All these factors may have contributed to the psychological well-being of these gender dysphoric adolescents.

As expected, puberty suppression did not result in an amelioration of gender dysphoria. Previous studies have shown that only GR consisting of CSH treatment and surgery may end the actual gender dysphoria [7,8,32]. None of the gender dysphoric adolescents in this study renounced their wish for GR during puberty suppression. This finding supports earlier studies showing that young adolescents who had been carefully diagnosed show persisting gender dysphoria into late adolescence or young adulthood [7,8].

Although both adolescent natal boys and girls had profited from GnRHa treatment, there were some sex differences. At baseline, gender dysphoric natal males were younger and showed less problem behavior than natal females. With a mean age of 14, most natal females had developed breasts and had their menarche. Why natal female gender dysphoric adolescents do not come to the gender identity clinic at an earlier age should be investigated further. One hypothesis is that parents of gender dysphoric natal female adolescents may consider some puberty development (e.g., menstruation) not as dramatic as beard growth or breaking of the voice in gender dyspho-

ric boys because it is less visible for the environment. The higher problem scores of natal females in this study may indicate that this assumption would be erroneous. Another explanation is that, in the period that this very first cohort received GnRHa treatment, the public as well as referring clinicians may not have been aware yet that girls might also profit from puberty suppression. In further studies, this explanation could be tested. Finally, a reason for a later referral of natal females may be that the threshold for seeking clinical help in girls is higher than in boys. Indeed, prepubertal girls with GID seen at two large gender identity clinics appeared to show more extreme gender dysphoria than boys and came to the clinics at a later age [23].

Some limitations of this study warrant comment. This study of psychological functioning and gender dysphoria did not focus on social and sexual relationships. Although it is not likely that the gender dysphoric adolescents would report favorable psychological functioning in the absence of satisfactory relationships with their peers and family, the topic deserves more attention. This is also applicable to sexuality, which is a complicated issue for young people having primary sex characteristics that do not match their gender identity.

Furthermore, this study only focused on the functioning of gender dysphoric adolescents before the actual GR. It showed that their situation improved, as compared with the pre-GnRHa phase. Long-term follow-up studies, however, should be performed to examine whether these adolescents will be able to maintain their relatively good functioning into their adult years after GR. In addition, effects of GnRHa on physical parameters are needed before broad conclusions can be drawn regarding the safety of puberty suppression [15].

Finally, this study was a longitudinal observational descriptive cohort study. Ideally, a blinded randomized controlled trial design should have been performed. However, it is highly unlikely that adolescents would be motivated to participate. Also, disallowing puberty suppression, resulting in irreversible development of secondary sex characteristics, may be considered unethical [33].

Conclusions

Gender dysphoria did not resolve as a result of puberty suppression. Psychological functioning, however, improved in various respects. We cautiously conclude that puberty suppression may be a

valuable element in clinical management of adolescent gender dysphoria. It relieves the acute distress accompanying gender dysphoria. Hence, by offering youths the possibility of healthy psychological development, puberty suppression helps in the exploration of suitable treatment options and making a balanced decision regarding GR.

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