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The Undervirilized Male

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Introduction

The developmental halt of the genital tubercle (GT) during gestation results in two different anatomical situations: the hypospadiac penis and the micropenis. The faulty process occurs during the first trimester of gestation, later for some other congenital anomalies A hypospadias is the result of a mal-development of the tissues forming the ventral aspect of the penis which causes an abnormal ventral opening of the urethra, a ventrally bent penis and an abnormal distribution of the penile skin. A micropenis is a fully formed penis but of small size.

Both conditions are classified as “Disorders of Sex Development” (DSD) which encompasses all congenital anomalies of the genital tract and their potential cerebral consequences. The term “Disorders of Genital Development” (DGD) might be easier to grasp for the surgeons.

Epidemiology

There are contradictory data on the incidence of the undervirilized penis. Several publications show an increasing incidence of these anomalies in the past decades whereas others state that is stable.[1,2,3] The incidence of hypospadias is commonly reported to be 1 in 250 male births with significant variations between epidemiological registers.[1] The incidence of micropenis remains undefined.

Etiology

The causes of hypospadias and micropenis are mostly unknown and probably multifactorial. However it is likely that four main protagonists are involved in the faulty construction of the GT.

The fetus himself with his genes, his hormones produced by his gonads and centrally regulated and the target tissues (GT) with their hormonal receptors and proteins.

1. *Faulty Genes: Genetic Mutations can Either be Isolated or a Part of a Labeled Syndrome*

   Family cases (or clustering) of hypospadias (from 10 to 25% of cases)[1,2] are common and suggest a possible genetic involvement. The recurrence risk in the male siblings of an affected child is about 15%.[3,4,5] Schnack *et al* found that hypospadias was equally transmitted through the paternal and maternal sides of a family, and recurrence risk ratios for brothers and sons of a hypospadias case were similar, indicating that genetic rather than intrauterine environmental factors have a principal role in causing familial hypospadias.[6] Many genes may be involved in the pathogenesis of hypospadias.

   - Genes involved in the penile development: homeobox genes (HOX),[7] FGF genes (FGF 10, FGFR2)[7,8]
   - Genes involved in the determination and development of the testes: WT1, SF1, SOX9, DMRT1, DAX 1, WNT4. Abnormalities of these genes may lead to diffferent expressions of DSD varying from female phenotype to undervirilized male , either in isolation or in association with other abnormalities (WT1 : renal disorders, SF1: adrenal dysfunction)
   - Genes involved in androgen synthesis located in Leydig cells: 3 beta hydroxysteroid-deshydrogenase, 17 hydroxysteroid-deshydrogenase, 17 alpha hydroxylase, LH receptor (Leydig cell hypoplasia), Smith Lemli Opitz syndrome
   - Genes involved in androgen action on the target tissues: 5 alpha reductase type 2 which transforms testosterone into dihydrotestosterone (DHT), androgen receptor gene
   - Recently new genes have been studied which may be involved in the construction of the genital tubercle:[9] ATF 3,[10] CXorf6[11]

2. *Chromosomal Anomalies*

Chromosomal abnormalities are detected in about 7% of patients with isolated hypospadias[12] and are more frequent (up to 32%) when hypospadias is associated with other genital abnormalities.[13,14] The following disorders have been reported.

- Klinefelter syndrome (47,XXY) and associated syndromes
- Mixed Gonadal Dysgenesis: 45,X0/46,XY with one palpable gonad on one side and a streak or no gonad on the other side, asymmetrical external genitalia and persistant internal mullerian duct structures
- 46, XX males: in patients with testes and a phenotype varying from normal male (generally when SRY gene is detectable) to patients with genital abnormalities (micropenis +/- hypospadias+/- un descended testicles, when no demonstrable SRY sequence is found)
- True hermaphroditism : 46,XX (60%), 46,XY/46,XX (40%) with variable degree of genital abnormalities (penile hypospadias or undersized penis
- Autosomal abnormalities such as trisomy 21

3. Abnormal hormonal stimulation of the GT can be due to an insufficient hormonal secretion by the gonads often labeled as "gonadal dysgenesis" a failed central regulation or incompetent target tissues. There are two informative periods after birth which may provide some clues about the hormonal origin of an insufficiently developed GT: in the first day of life when the child's hormonal cascade is still under the stimulation of the placenta[15] and in the "mini puberty" between days 15 and 90 of life[16] when there is a flare of gonadotrophic hormones before a long period of quietness until puberty. During these two privileged periods, Leydig cell (testosterone and its precursors) Sertoli cell (AMH and B Inhibin) and gonadotrophic hormones (FSH, LH) can all be measured and beyond the third month of life, AMH[17] and the androgens can only be measured after HCG stimulation. However, it is important to note that there is no consensus between centres about the HCG stimulation protocols and their interpretation.[18] In our centre, 6 intramuscular injections of 1500IU are given over a period of 12 days and plasma steroids are measured on the 13th day.[19] Plasma testosterone above 10 nMol/L is considered as a satisfactory response to HCG stimulation. AMH above 600 pMol/L is interpreted as normal.[17]

a) It is also important to report that there is no consensus on the histological definition of gonadal dysgenesis. This term is commonly used when the hormonal response to stimulation is low.

   Tissue targets are also essential actors, especially androgen receptors whose genes can be sequenced when all previous hormonal screening is normal, particularly if the testosterone response to HCG stimulation is explosive.[20] Beside hormonal receptors, the tissue proteins also play important roles in the development of the GT. Preliminary studies showed that the protein balance between destructive (enzymes) and the constructive proteins on the ventral aspect of the hypospadiac penis are disturbed compared to those on the dorsum of the penis or foreskin controls.[21]

b) The placenta probably plays a role as a major hormonal source especially during the first part Prematurity, low birth weight and twin pregnancies are risk factors for hypospadias possibly related to insufficient placental function. One of the essential clues on the role of the placenta was given by a Swedish study[2] on monozygotic twins where only one child (the smaller) had a hypospadias. This clinical model demonstrated that with similar genes and disruptor environment, only one child was affected which tends to incriminate the placenta as the main cause of the GT mal development.

   Other causes of early placental dysfunction like pre-eclampsia or hypertension[22,23] or in utero exposure to diethylstilbestrol are potential risk factor for hypospadias. Other studies[24,25] showed a trend to lower placental and fetal weight in infants with hypospadias.

c) The mother is the overall controlling system. Several maternal diseases or treatments have been reported to affect the construction of the genital tubercle including diabetes mellitus, epilepsy, renal failure, asthma[26] and influenza during the first trimester. Most of these conditions lead to low birth weight which is often found in hypospadiac patients. Some studies found that maternal age (over 35 years) may also contribute to an increased risk of hypospadias[27,28,29,30] but these findings were not confirmed in other studies.[1,31]

   Subfertility (delay to get pregnant) was found to be twice as long for mothers of hypospadias boys than for controls[1] Wennerholm *et al* found a higher frequency of hypospadias after intracytoplasmic sperm injection (ICSI) than after conventional IVF, and suggested that paternal subertfility could explain the association between hypospadias and ICSI.[32] Other studies did not find any link between hypospadias and low fertility[33] or found a similar risk with ICSI and IVF.[34] A maternal vegetarian diet has also been

incriminated due to an increased amount of phytoestrogens.[23,35] However, there are no conclusive epidemiological data to show that prenatal exposure to estrogens (*e.g.* diethylstilbestrol, oral contraceptives) causes hypospadias.[36,37,38] Maternal smoking may cause lower birth weight, but the relationship with hypospadias has not been established.[39]

d) The environment with its disruptors and promoters may influence the genital development.

Environmental factors may play a role in the etiology of hypospadias and could explain the deterioration of the male reproductive health (such as the increasing incidence of undescended testes, testicular cancer, hypospadias and low sperm count) noted in the last 30 years.[40,41,42] These findings could be related to an exogenous maternal exposure before or during pregnancy to some environmental xenoestrogens (such as herbicides, pesticides, plasticizers, and polystyrenes) that mimic estrogens,[41] or to environmental antiandrogens (such as polyaromatic hydrocarbons, linuron, vinclozolin, and pp'DDE) or other endocrine disruptors. Residence in the areas with intensive industrial or agricultural activity (farming, gardening or vineyard regions) is also reported to give a significantly increased risk of hypospadias.[1,43]

4. Anatomy of The Undervirilized Genital Tubercle

a) Hypospadias is characterized by an abnormal division of the corpus spongiosum which can be anywhere between the glans and the perineum. This delineates a ventral triangular area whose summit is the division of the corpus spongiosum, the lateral sides the pillars of the atretic spongiosum which join the base of the glans in a fan shaped direction and the base is the wide open glans. All tissues sitting in this triangle are insufficiently developed. The urethra proximal to the ectopic opening is thin as well as the skin covering it which is very adherent. The urethral tissues lying beyond the urethral meatus form a longitudinal strip which joins the apex of the glans. The ventral curvature of the penis is mostly due to the poor development of the tissues lying beyond the division of the corpus spongiosum. Experience shows that most ventral curvatures are straightened straight that once the ventral aspect of the hypospadiac penis has been fully dissected. In a small percentage of cases, the ventral curvature is related to the asymmetrical development of the corpora cavernosa which requires a corporeal plication.

b) Hypospadias classifications are mostly based on the position of the urethral meatus which is an inadequate criterion to define the severity of hypospadias. The other important parameters which affect the technique of repair of hypospadias may only be found at the time of surgery when the ventral aspect of the penis has been fully dissected. They include the level of division of the corpus spongiosum (*i.e.* the length of ventral hypoplastic tissues), the broadness of the glans and the availability of dorsal tissues. We would therefore recommend distinguishing those with a distal division of the corpus spongiosum which have little or no ventral curvature from those with a proximal division of the corpus spongiosum which have a significant curvature. The hypospadias "cripples" who have had several previous unsuccessful procedures should be kept apart as they require individual specific evaluation and repair.

c) Micropenis is entirely different as the penis itself is normally formed but has not grown to its full size. Penis under 25mm long during the first year of life or under 2 to 2.5 SD[44,45] below the mean stretched length should be investigated. It must be distinguished from the concealed penis (buried, trapped or webbed penis). The buried penis is a normal sized penis with a congenital defect of the height of the skin shaft. The webbed penis is characterized by the skin of the shaft being tethered to the ventral aspect of the scrotum.

Micropenis can be the result of a failed gonadotrophic stimulation such as hypogonadotrophic hypogonadism (pituitary or hypothalamic disorder, isolated or syndromic such as the Prader Willi syndrome). It can also be the consequence of other hormonal deficiencies such as GH deficiency, 5 alpha reductase deficiency or of partial androgen insensitivity.[46]

5. Diagnostic Dilemmas

Most hypospadias and micropenis cases are noted at birth and do not represent any diagnostic difficulty. However, in some situations the severity of "hypovirilization" and/or association with other genital anomalies (hypospadias +/- micropenis +/- undescended testes) or the discrepancy between the child's karyotype and his (her) genital appearance, make difficult or impossible the choice of gender (gender assignment). In such situations, the legal declaration of the sex of the baby should be delayed and a multidisciplinary team experienced in DSD should be involved to evaluate the child's situation. Some of

these difficult cases can be identified during the prenatal period especially when there is a discrepancy between the karyotype and the ultrasound appearance of the genitalia.

The time where 46,XY patients with poorly developed penis were assigned to the female gender[44,47] is hopefully over. This attitude was driven by the surgeons who stated that it was definitely easier to create a penetrative conduit than a penetrating organ. The disastrous outcome of this attitude led many to reconsider the management of such patients.[48,49] The conclusions of Professor Woodhouse's series on a population of adult males with micropenis[50] and the significant progress made with phalloplasty have changed the approach to these critical situations. It is still too early to say if this move is satisfactory or not but it appears clearer and clearer that in some complex genital ambiguities there is no good solution but only least bad ones.

Upstream to any decision, one should challenge the definition of each individual identities and how to define a boy and a girl. It is actually amazing that at the dawn of the third millennium this question remains unanswered. An attempt to structure the discussion on these highly emotional issues was started with the Chicago DSD consensus conference in 2005.[51] The consensus statement was, not surprisingly, lukewarm but had the merit of pushing various teams into a more global reflection on these issues. A lot more needs to be done which will involve different medical and non medical contributors, in fact the whole of society.

a) The Identity Issue: In order to bump against the traditional concepts, it is worth distinguishing between the Individual Sex Identity, the Social Gender Identity (SGI) and the Behavioral Identity (BI).[52] The first and the third are quite subtle and shape up during childhood. They are not visible at birth. The second one is rigid and represents the visible part of the iceberg. It is highly dependent upon the cultural medium in which the baby lives. ISI could be defined as our personal perception of our sexual adherence to the male or female gender or something in between. SGI involves the concept of gender which is a social concept *i.e.* given by the group with whom the individual lives. SGI is the way the social mirror reflects the individual image. It is the way one becomes visible. BI is the erotic inclination of each individual which, here again, is likely to be shaped by many factors.

b) The Tools of Decision: The inability to identify and name the sex of a newborn is a cruel experience for the parents who suddenly become withdrawn from their family. It is therefore a matter of relative urgency to help these parents by gathering the clues available to assign a gender to their child. Four main indicators will influence the decision taken with the parents by a multidisciplinary team.
   - The internal sex which is constituted by the hormonal and genetic profiles of the child.
   - The external sex which is the visible part of the iceberg and is represented by the size of the GT, the presence or absence of gonads in the genital folds and the possible presence of mullerian structures such as a retro-urethral cavity.
   - The functional sex which is the potential future fertility as a male or as a female and the potential capacity to have intercourse.
   - The social and cultural medium around the child and which considerably influences the parents' feelings about the situation. Although the medical team has a significant influence on the parents' perception, no decision should be taken without their full approval.

6. Treatment Alternatives

The management of DSD patients requires a specific hospital environment involving paediatric endocrinologists, geneticists, pathologists, psychologists, biologists, radiologists and paediatric urologists. Specialized centres should have large catchment areas and should therefore be limited in number. National and supranational DSD networks for clinical care and research projects are strongly encouraged and this is the rationale behind the Euro DSD project.

a) Hormonal Stimulation: The aim of hormonal stimulation is to enlarge the penis. It is interesting to remind, that, between birth and puberty, the penis will almost double in length and diameter although the androgen secretion by the testicles is almost undetectable. The growth of the penis during childhood is most likely GH driven alone or with other steroid hormones.[53,54,55] It would therefore make sense to use GH[56] rather than testosterone to enlarge the penis in prepubertal boys although the costs and the other effects of GH make it difficult to use. Data on penile size in GH treated children are lacking but we do know that many children with GH deficiency and Laron syndrome have a micropenis.[54] During puberty, premium leading role for androgens in penile growth is most likely. There is no consensus on androgen stimulation for hypospadias patients and micropenis. Three main

presentations are used in this respect: systemic testosterone (testosterone enanthate), topical dihydrotestosterone and HCG. There are concerns that androgen stimulation might affect the bone growth particularly after the age of 2 although these data are poorly documented.[57]

The most commonly used regimen is intra muscular injections of long-acting testosterone (testosterone enanthate) , at a dose of 50 to 150 mg/m² per injection every 2 to 4 weeks,[44,57,58] for 1 to 4 months. Human HCG treatment may have a positive but transient effect on penile growth, especially if the underlying problem is a gonadotropin deficiency and if the treatment is started early in life.[59,60,61]

Transdermal application of dihydrotestostérone has been reported to increase penile growth[62] and is the first choice in boys with 5 alpha reductase deficiency which is a very rare condition. There are few adverse effects and they are usually transient (accelerated growth velocity and bone age).[59,63]

Topical testosterone is not recommended because of the variability of skin absorption leading to uncertain results and potentially to systemic effects. There are also reports showing that androgens might be detrimental for the skin healing process after surgery. A preliminary study on hypospadias[64] showed that patients treated with preoperative testosterone had more healing complications than the non-treated ones. Among the androgen stimulated patients, those who received the treatment less than 3 months prior to surgery had more complications than those who received it more than 3 months before repair. The same report showed that estrogen stimulation might help the skin healing process and a clinical research study is currently being set up with pre-operative topical estrogens to evaluate these effects.

Androgen stimulation in prepubertal children is quite effective on the growth of ventral segment of the penis located proximal to the division of the corpus spongiosum and in the growth of the dorsum of the penis. The tissues located in the triangle created by the division of the spongiosum are less androgen sensitive. It is therefore not surprising that these treatments have also been used to downgrade the severity of hypospadias.[64]

b) DSD Surgery: The surgery of the conditions covered by the term DSD is complex and requires skills that have few parallels in other branches of the paeditric canon. This and the rarity of the conditions mandates that it should be concentrated in the hands of those with the requisite experience.

i) Masculinization

1. Hypospadias repair is a challenging surgery with a significant number of complications. It involves 3 main steps:
   a) The full dissection of the penis to expose the division of the corpus spongiosum, to evaluate the penile curvature, the quality of the urethral plate, the size of the glans, the length of urethra to be refashioned and the availability of the dorsal skin.
   b) It is only then that the reconstruction of the missing urethra (urethroplasty) should be envisaged. There is a common temptation by some to universalize one technique for all types of hypospadias. This has never worked and one should emphasize that an experienced hypospadiologist should be able to use several techniques and adjust them to each patient and not the opposite way round.

      ● Short urethroplasty: If the urethral plate is wide and healthy and if the urethroplasty is less than 2 cm, a Thiersch-Duplay tubularisation[66] is the 1st option for many. If the urethral plate is healthy but not wide enough to be tubularized, the TIP procedure[67] which splits it longitudinally can be an alternative. The easiness of this procedure has pushed many to extend its use to more proximal hypospadias.

      Alternatively, the full mobilization of the urethra described by Koff[68] is a good option as long as the distal urethra is healthy and well covered by spongiosum. This technique has the main advantage to avoid any sutures on the urethra and of any non-urethral tissue. The disadvantage of the Koff technique is that it involves an extensive dissection of the whole urethra down to the base of the penis.

      Another technique for a short urethroplasty is the Mathieu technique[69] which uses a rectangular flap of ventral skin hinged to the ventral edge of the ectopic meatus.

This technique is simple and has had a reasonably good records on a long-term basis as it was described in 1932. It has however the disadvantage of using a skin flap with a poor blood supply.

- For longer urethroplasty: Some of the techniques mentioned above are usable for longer repair but, once again, easiness is not always a good friend in hypospadiology. In more severe hypospadias, the need for more material to reconstruct the urethra is common. The dorsal skin has several merits including its good blood supply, its protein contents which appears to be more balanced and more androgen sensitive than the ventral tissues. The onlay urethroplasty[70] has the many advantages and a good long-term record.[71]

- For the most severe proximal hypospadias, the urethral plate is no longer preservable and needs to be replaced currently using 2 main techniques: The Koyanagi-Hayashi procedure[72,73] where all ventral, lateral skin and inner prepuce are mobilized with their blood supply and transferred ventrally to refashion the whole penile urethra; The 2 stage Cloutier-Bracka procedure[74,75] where the ventral aspect of the straightened penis is grafted with the inner foreskin or buccal mucosa. In a second stage, this tissue is duplay-ed. The most severe hypospadias cases often require several procedures to achieve an acceptable result. They are exposed to complications related to the abnormal urodynamic profile of the reconstructed urethra which implies a long-term follow-up.

- In repeated surgery after failed previous procedures "Hypospadias cripple", the need for fresh material for urethroplasty is common. Multiple tissues have been used to replace inadequate scarred segments of urethra. Buccal mucosa is the most commonly used material. It can be either fashioned as an onlay urethroplasty or placed on the raw area of a split urethral plate as an Inlay urethroplasty. Mucosal patches probably have urodynamic profiles closer to those of a normal urethra.

2. Phalloplasty

   Paediatric Urologists have little or no experience of phalloplasty in prepubertal boys. Both Hoebeke and de Castro[76,77] to have started this complex surgery in children and adolescents with highly deficient penis. Long-term data are lacking but it is definitely a step forward to keep children with severe genital deficiency in their gender without reassigning them in the female gender.

3. Feminization

   Feminization is the ultimate alternative for patients carrying Y material. Its indications in the 46,XY patient has considerably decreased as well as in the 45,X0/46,XY patients. The remaining indications are essentially represented by the Complete Androgen Insensitivity Syndromes (CAIS), sporadic extremely severe micropenis or Partial Androgen Insensitivity Syndromes (PAIS) with poor androgen response, 5 alpha reductase deficiency, 17 hydroxysteroid-deshydrogenase deficiency, LH receptor deficiency and complete gonadal dysgenesis . 46,XY ovotesticular DSDs are most exceptional. Discussions about gender assignment may occur for children with insufficiently virilized genitalia with 46,XX karyotype and no detectable Y material. This surgery includes 3 main steps.

4. Creation of a vagina either by connecting an existing retro-urethral Mullerian cavity to the pelvic floor (45,X0/46,XY); or by dilating an existing vaginal cup (CAIS); or by creating a penetrative conduit using either bowel, peritoneum or skin flaps. Timing of this surgery remains highly debatable.

5. Reducing the size of the GT. This step is very much under scrutiny as it may damage the sensitivity of the glans/clitoris. Nerve sparing techniques developed in CAH patients (congenital adrenal hyperplasia) and in epispadiac males have considerably changed over the past decade, allowing hopefully a better preservation of the glans sensitivity. Unfortunately, we will have to wait a few more years to know if these technical changes are beneficial for the patients.

6. Refashioning the perineal anatomy by lowering and defattening the genital folds.

   The technical aspects of this surgery are detailed in another chapter of this book.

c) *Gonadal surgery has two main objectives:* The preservation of the exocrine and endocrine testicular functions; the close follow-up of testicles with a high risk of malignancy.

In the particular situation of 45,X0/46,XY patients, one gonad (commonly the right one) is usually intrascrotal whereas the left one is often intra-abdominal and dysplastic (streak). In most cases this intra-abdominal gonad will be removed laparoscopically. The potential risk of tumour of the intra-scrotal gonad is unclear but a close follow-up is certainly needed. The question of removing all gonads in Mixed Gonadal Dysgenesis remains unanswered.

d) *Surgery of Mullerian Remnants:* This surgery is recommended when the child is definitely assigned in the male gender and if these remnants are a potential source of future troubles. Uterine remnants such as an excluded hemi uterus are easily removed by laparoscopy. Menstruations are possible by androgen conversion (aromatase conversion) causing retention in uterine remnants and potential complications.

Removal of a utricular cavity is indicated if the child becomes dysuric or gets recurrent urinary tract or orchiepididymitis. Although the fertility of these patients is compromised from the beginning, the removal of the utricular cavity puts the vas deferens at risk as it runs close to the utricular walls.

DSD	**Risk (%)**
CAH 46XX	0
CAH 46 XY	0-47
Turner XO	0
Turner X0/**Y	7-12% (prepubertal) 33-50% (>30 years)
Ovo-testicular disorder 46XX	Rare
Ovo-testicular disorder 46XY	< 3%
CAIS	<1%
PAIS	15% (prepubertal) 20-30% (untreated) Unknown (scrotal)
46XYGD	15-30% (undescended) Unknown (scrotal)
5α reductase	= normal undescendent testis
Persistent mullerian duct syndrome	18% = intraabdominal testis
Frasier	60%
Deny-Drash	40%

7. *Outcome*

a. *Outcome of hypospadias surgery:* This is quite a sensitive issue as there is no agreed objective way to assess the results of hypospadias surgery. There are few important aspects.

i) The cosmetic results are evaluated quite differently by the patient and the surgeon. More and more restrictions are being put on the use of photography.

ii) The functional results involve the quality of micturition which is difficult to assess with urine flow studies as the dynamics of the reconstructed urethra tends to flatten the curves. Moreover, most patients who have had urethral surgery and kept a catheter for a while tend to have dyssynergic micturition although no anatomical obstruction is found in their urethra. Experience shows that children have a great capacity to adjust themselves to dysuria and only those with severe symptoms complain. Visual flow studies are most subjective. Pre-micturition ultrasound to measure the bladder wall thickness and post-micturition ultrasound to measure urine residues are objective criteria to assess the efficiency of bladder emptying.

iii) The functional results also involve the quality of sexual life in older patients and its subjective assessment is well known to all. Few publications exist[79,80] on this topic and none have considered the evaluation of the glans sensitivity after hypospadias surgery whereas this issue is dominant in clitoral reduction. Evaluation of hypospadias outcome by the patients shows a low satisfaction regarding penile length for severe hypospadias. Measurements of the repaired penis in this group were shorter than in the controls (10.8 vs 12.1 cm).[81] Another study on the quality of sexual life found that the severity of hypospadias and the number of operations were key factors that influenced the sexual psychology of the patients.[82] A literature review[83] reported a considerable discordance of the effects of hypospadias on sexual function; a few publications reported patient and partner dissatisfaction with the appearance of genitalia; ejaculatory disturbances ranged between 6 and 37% of operated individuals. However, there was no convincing evidence of impaired fertility.

iv) Complications of this surgery are common and vary considerably from one publication to another. In general, healing complications (fistulae, urethral dehiscence, urethral stenosis) are the most common and are dependent upon the initial severity of hypospadias, the pre-operative stimulation, the technique used, the blood supply of the mobilized tissues, the experience of the surgeon and the quality of post-operative care. Overall, the complication rate varies between 5 and 20% for hypospadias with an anterior division of the corpus spongiosum and between 25 and 75% for the ones with a proximal division.

b. Outcome of Micropenis: Few studies documented long term follow up into adulthood of patients with micropenis. They are short series which should be cautiously interpreted. Patients were satisfied with their sex of rearing.[84,85,46]

The size of their penis may affect their quality of life[86,84] with disturbance during urination or in the changing room (Money 1985) or during vaginal intercourse. Other studies showed no major alterations in male sexual activity, comfort or identity[50] and the men usually enjoyed stable relationship.[87] Close medical follow up, compliance with androgen replacement therapy and understanding and supportive parental attitude were identified as being more important than penis size.[76,88]

c. Outcome of Phalloplasty: Long term data are even more scarce in the group of DSD men who underwent a phalloplasty. Interpretation of the results in the adult population should be cautious as most phalloplasties were performed in transsexuals who are a very specific population. Although there are many technical similarities, the psychological profiles of the two groups are very different and difficult to compare. What we know though about phalloplasty is that this surgery should be concentrated in very few specialized centres considering the high reported complication rate.[89,88]

d. Outcome of Feminization Procedures: This is a major issue which is covered elsewhere. It begins with the endless debate about the effects of clitoral reduction on sensitivity and quality of sexual life. These questions are certainly at the heart of the reticence towards surgery expressed by several patient groups who are suffereing the inadequate results of surgical procedures performed more than 20 years ago.

Psychological counselling by experienced child psychiatrists and/or psychologists is an essential step in the management of children with Disorders of Genital Development.

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