Laparoscopic Management of Mullerian Remnants in a Patient with Mixed Gonadal Dysgenesis: A Case Report*

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One in 300 to 4,500 infants is born with abnormalities of the external genitalia and Mixed Gonadal Dysgenesis is the second most common cause. This is a case of a 12-year old child, raised as male and diagnosed to have ambiguous genitalia at birth. Analysis showed a mosaic karyotype, one cell line with 45 chromosomes including a Monosomy X and a second cell line showed a normal 46, XY karyotype. A thorough evaluation by a multidisciplinary team composed of a reproductive endocrinologist, pediatric gynecologist, pediatric urologist, pediatric endocrinologist, geneticist and child psychiatrist was made. The patient underwent pre-operative diagnostic cystourethroscopy and genitoscopy, total laparoscopic hysterectomy with bilateral gonadectomy and first stage repair of hypospadia. Laparoscopic management was the best approach for this patient because it provided minimally invasive surgery for children and enabled all necessary procedures, including evaluation, biopsy, and gonadectomy, for diagnosis and treatment.

Key words: intersex disorders, mixed gonadal dysgenesis, ambiguous genitalia, laparoscopic hysterectomy

Introduction

Depending on the geographical, religious and cultural background, one in 300 to 4500 infants is born with abnormalities of the external genitalia. Mixed gonadal dysgenesis (MGD), the second most common cause of ambiguous genitalia in a newborn, comprises a heterogenous group of intersex disorder characterized by the presence of a testis on one side and a contralateral streak or an absent gonad.[1] Despite the documented increased incidence malignancy, the ideal timing and nature of surgical reconstruction in such individuals remains controversial and evidence-based recommendations still cannot be made. However it is generally accepted that diagnosis, surgical decisions and optimal long-term management require an experienced multidisciplinary team and not just specialist surgeons.

This is a case of a 12-year old child, raised as male and diagnosed to have ambiguous genitalia at birth. A thorough evaluation by a multidisciplinary team composed of a reproductive endocrinologist, pediatric gynecologist, pediatric urologist, pediatric endocrinologist, geneticist and child psychiatrist was made. The agreed procedure was for the patient to undergo pre-operative diagnostic cystourethroscopy and genitoscopy, total laparoscopic hysterectomy with bilateral gonadectomy and first stage repair of hypospadia. This paper aims to discuss and consider laparoscopic approach for children with DSDs, allowing the benefit of a minimally invasive surgery that enables all necessary procedures, including

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evaluation, biopsy, and gonadectomy, for diagnosis and treatment.

The Case

The patient is HE, a 12-year-old child raised as male, Filipino, Roman Catholic admitted at the Philippine General Hospital with a chief complaint of ambiguous genitalia. The patient was born preterm at 7 months age of gestation via primary cesarean section, first of twin boys of a then 21-year-old mother, Gravida 2 Para 0 (0010). Newborn screening done at 1st week of life was normal.

His mother is a 32-year-old OFW, with no vices and no known co-morbidities. His father is a 40-year-old driver, non-smoker, occasional alcoholic beverage drinker and with a history of illicit drug use. His father has one living child (16 years old) with a previous partner. His mother stands 162.5 cm while his father stands 165cm.

Since birth, the patient was noted to have ambiguous genitalia however no further work-up or intervention was done. At 5 years old, his parents noted that he preferred to void sitting down. Initial consult was done at 6 years of age with a general pediatrician and was then assessed to have cryptorchidism and hypospadia. Karyotyping was done and on analysis of 10 cell lines, result showed a male karyotype (46 XY). Both transcrotal and transabdominal ultrasonography failed to demonstrate testis, epididymis or pampiniform vessels on either side. The initial surgical plan was to do diagnostic laparoscopy, possible orchidopexy versus orchiectomy, and first stage repair of hypospadias but the patient was lost to follow-up.

At 11 years of age, the patient consulted a tertiary training institution and was then noted to have bilateral undescended testes and hypospadia with chordee. He was admitted under the Urology service for diagnostic laparoscopy, possible bilateral orchidopexy versus orchiectomy, first stage repair of hypospadia. Basal hormonal evaluation showed decreased testosterone, DHEAS and estradiol levels. The 17-OHP and FSH levels were elevated. The AMH, LH, FT4, TSH and IGF-1 levels were normal (Table 1). Pelvic ultrasound showed infantile uterus with thin endometrium and small ovaries (Figure 1). X-ray of left wrist exhibited a bone age between 12 to 14 years (Figure 2). Analysis of metaphases from blood culture showed a mosaic karyotype with 2 cell lines which was confirmed by G banding. One cell line showed an abnormal karyotype of 45 chromosomes including a Monosomy X, identified in 8 cells (45 XO). A second cell line showed a normal male karyotype (46 XY), identified in 92 cells (Figure 3A and 3B).

On physical examination, he stands 132cm and weighs 25.6 kg with a BMI of 14.7 kg/m^2 (Figure 4). He had essentially normal systemic findings. The external genitalia and pubic hair were compatible with Tanner 1 staging (Figure 5). On pelvic examination, the patient had male-resembling external genitalia. The penile shaft measured 3.0cm x 1.5cm x 1.5cm. The urethral

Table 1. Basal hormonal assay of the patient.

Hormones	Result	Normal values
17-OHP	2.9 ↑	0.63 - 2.15 mIU/ml
Testosterone	3.3 ↓	9 - 38 nmol/L
Anti-mullerian hormone	4.04 (Normal)	1.12 - >17.2 ng/ml
LH	6.1 (Normal)	1.9 - 9.4 mIU/ml
FSH	12.7 ↑	1.0 - 10.5 mIU/ml
Estradiol	11.3 ↓	15 - 71 pg/ml
IGF-1	513.9 (Normal)	93 - 567 ng/ml
TSH	2.0 uIU/ml (Normal)	0.3 - 3.8 uIU/ml
FT4	20.5 pM (Normal)	11 - 24 pM
DHEAS	1.7 umol/l ↓	3.8 - 17.5 umol/l
Repeat testosterone	0.3 ↓	9 - 38 nmol/L

meatus was ventrally displaced. Inferior to the urethral meatus was a 0.4 cm orifice, which on gentle probing seemed to end blindly. The labioscrotal folds were hyperpigmented and empty. Uterus and adnexa could not be palpated, and no masses were detected in the inguinal canals.

A multidisciplinary team composed of a reproductive endocrinologist, pediatric gynecologist, pediatric urologist, pediatric endocrinologist, geneticist and child psychiatrist was convened and the team agreed that the patient had to undergo pre-operative diagnostic cystourethroscopy and genitoscopy, total

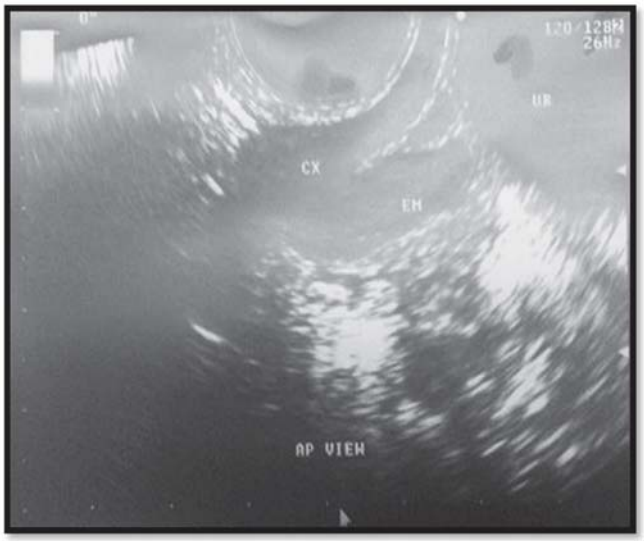

Figure 1. Transrectal Ultrasound (Anteroposterior view).

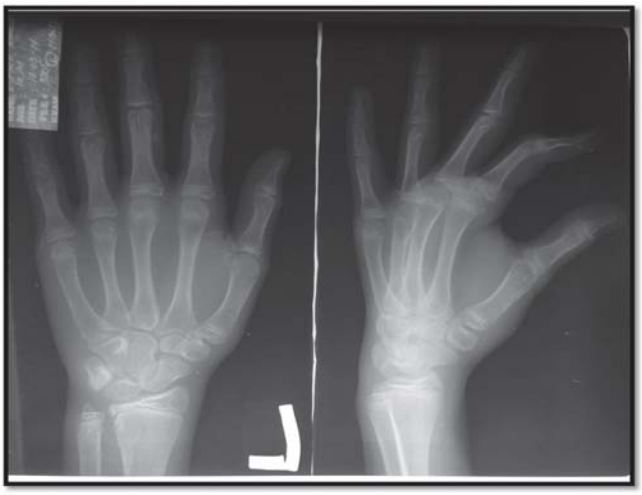

Figure 2. X-ray of the patient's left hand for bone aging was compatible with 12 to 14 years of age.

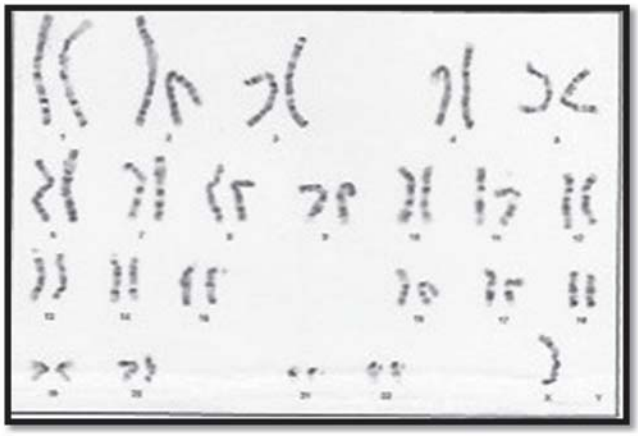

Figure 3A. Chromosomal analysis showing an abnormal karyotype of 45 chromosomes including a Monosomy X, identified in 8 cells.

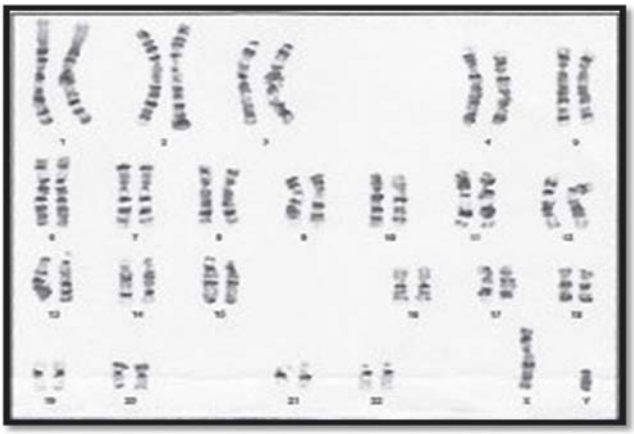

Figure 3B. A second cell line showing a normal male 46, XY karyotype, identified in 92 cells. This was confirmed by gross G banding.

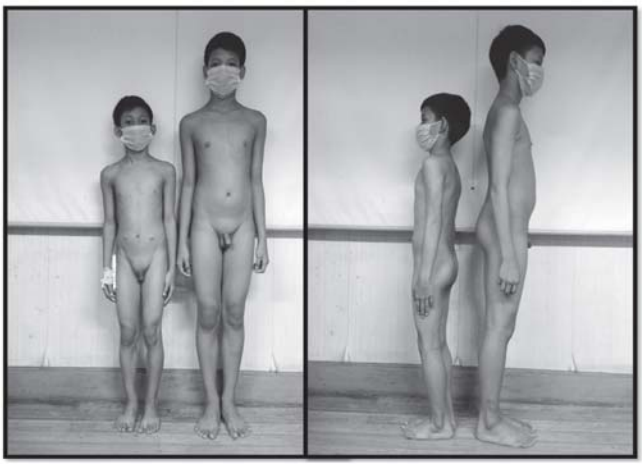

Figure 4. The index patient (left) and his twin brother (right). The index patient stands 130 cm while his twin brother stands 155.5 cm.

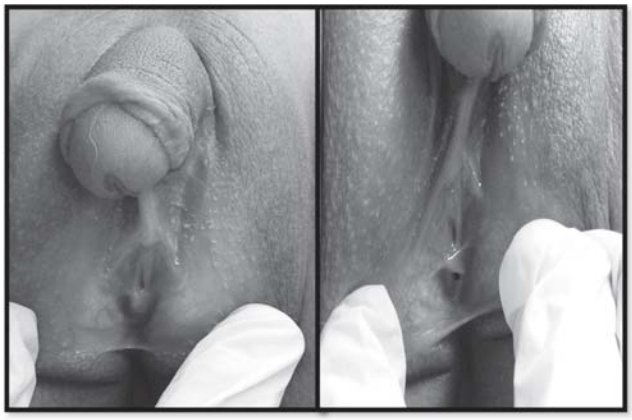

Figure 5. Pelvic examination showed male-resembling external genitalia. The penile shaft measured 3.0 x 1.5 x 1.5 cm. The urethral meatus was ventrally displaced. Inferior to the urethral meatus was a 0.4 cm orifice, which on gentle probing seemed to end blindly. The labioscrotal folds were hyperpigmented and empty. Uterus and adnexa could not be palpated, and no masses were detected in the inguinal canals.

laparoscopic hysterectomy with bilateral gonadectomy and first stage repair of hypospadia.

On urethroscopy, the urethral mucosa was pink and smooth, urethrovesical junction was intact. On cystoscopy, the trigone was smooth and pale, bilateral ureteral orifices were patent with good efflux of urine. The rest of the bladder mucosa was smooth and normal (Figure 6A to 6C). There are no defects seen. On genitoscopy, there was a communication between the vaginal orifice and the uterus.

On laparoscopy, there was no ascites. The liver, subdiaphragmatic surface, gallbladder, intestines, and omentum were smooth and grossly normal. The uterus measured 2.0 x 1.5 x 0.8 cm smooth and with tan surface. The cervix measured 5.0 X 1.0 X 0.8 cm. The endometrial cavity measured 1.5 cm with a 4.8 cm endocervical canal. The myometrium measured 0.4 cm while the endometrium measured 0.1 cm (Figure 8). The left gonad measured 1.0 x 0.8 x 0.3 cm, which on cut section showed smooth, whitish, fibrous tissue within (Figure 9). The right gonad measured 2.2 x 1.8 x 1.0 cm with smooth, tan capsule. On cut section, pink glandular tissue within with no areas of hemorrhage or necrosis (Figure 10). A thorough search of both inguinal canals and the anatomic pathways of testicular descent failed to identify any evidence of testicular structures. A thinned out structure attached to the lateral ends of the uterus was noted to enter the inguinal ring bilaterally but with no testis within. The rest of the abdominopelvic organs were grossly normal (Figure 7A to 7E)

Histopathologic examination revealed a uterus with atrophic endometrium and prostatic tissue within muscle (Figure 11). Biopsy of the right gonad showed calcified testis, immature, with epididymis and vas deferens (Figure 12A to 12D) while the left gonad resembled oviduct tissue with immature testis (Figure 13).

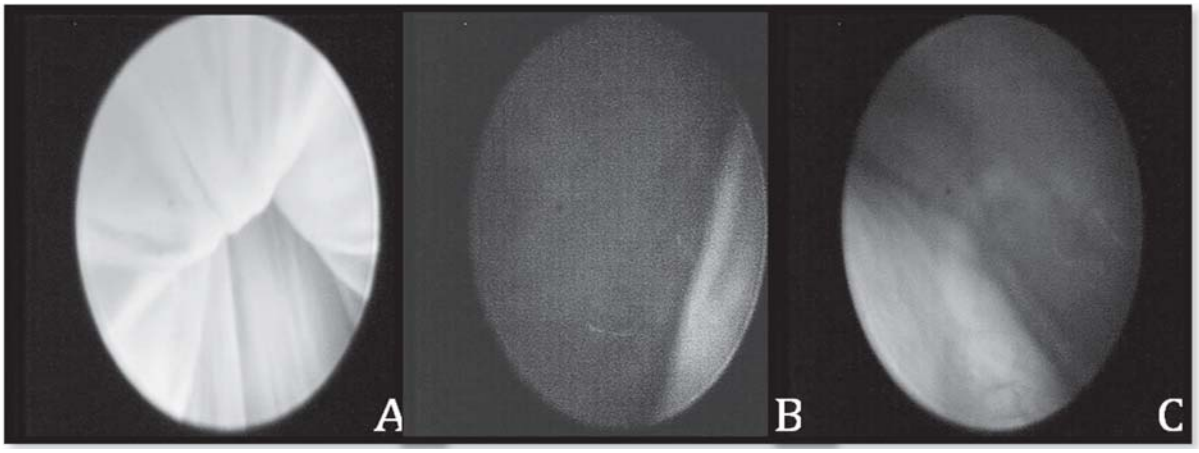

Figure 6. On urethroscopy, the urethral mucosa (A) was pink and smooth, urethrovesical junction was intact. On cystoscopy, the trigone was smooth and pale. The right (B) and left (C) ureteral orifices were patent with good efflux of urine. The rest of the bladder mucosa was smooth and normal. There are no defects seen.

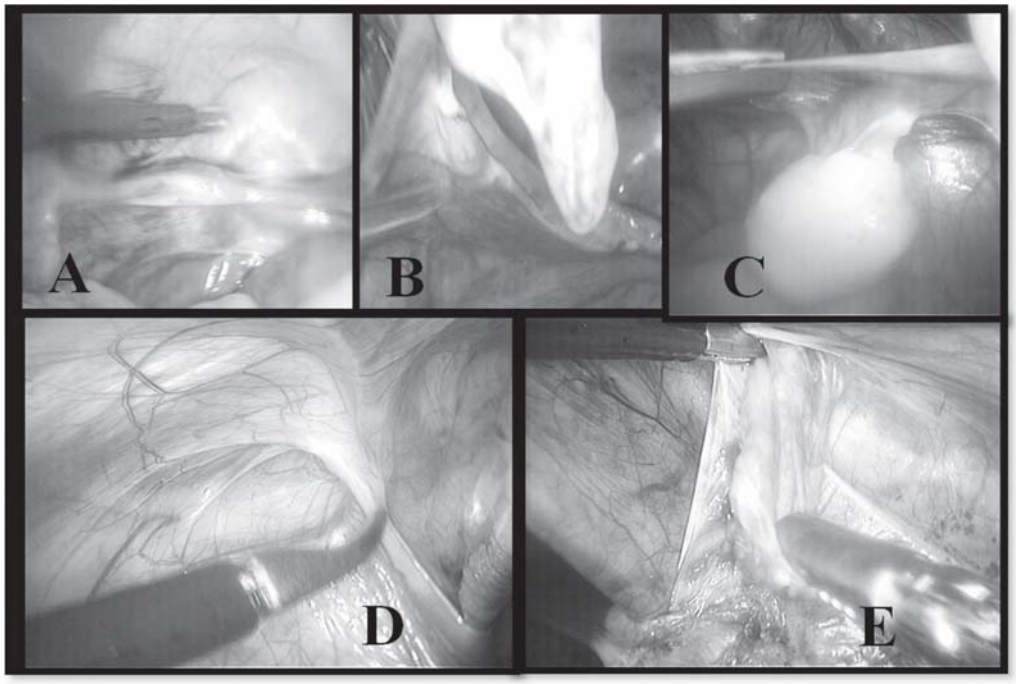

Figure 7. On laparoscopy, the uterus measured 2.0 x 1.5 x 0.8 cm smooth and with tan surface (A). The left gonad measured 1.0 x 0.8 x 0.3 cm (B). The right gonad measured 2.2 x 1.8 x 1.0 cm with smooth, tan capsule (C). A thorough search of both inguinal canals and the anatomic pathways of testicular descent failed to identify any evidence of testicular structures. A thinned out structure attached to the lateral ends of the uterus was noted to enter the inguinal ring bilaterally but with no testis within (D and E). defects seen.

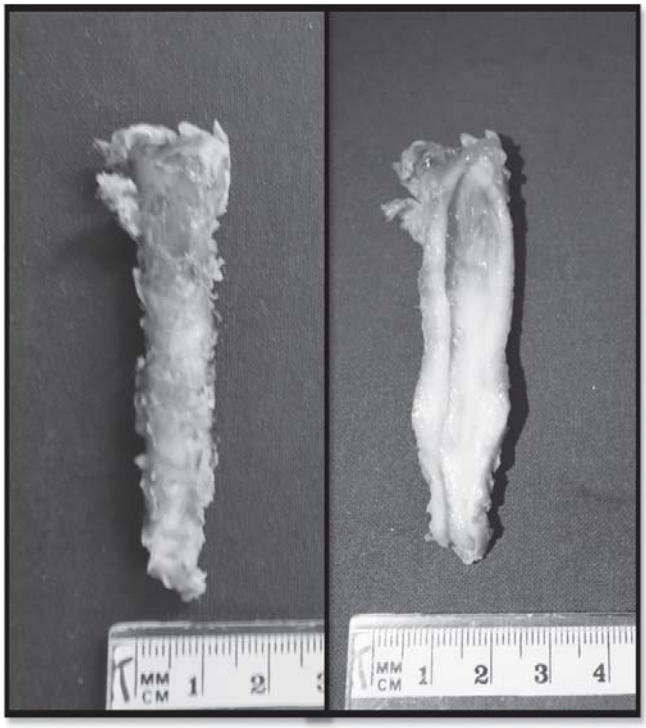

Figure 8. Gross specimen of uterus and endocervical canal.

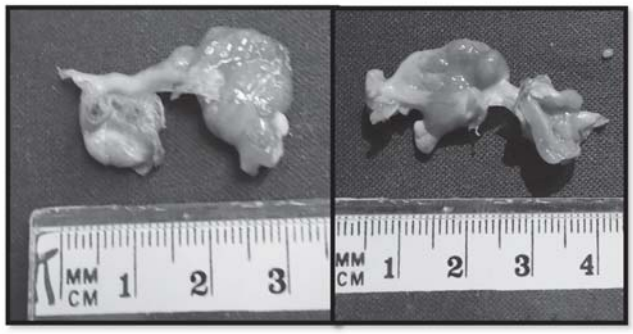

Figure 9. The left gonad measured 1.0 x 0.8 x 0.3 cm, which on cut section showed smooth, whitish, fibrous tissue within.

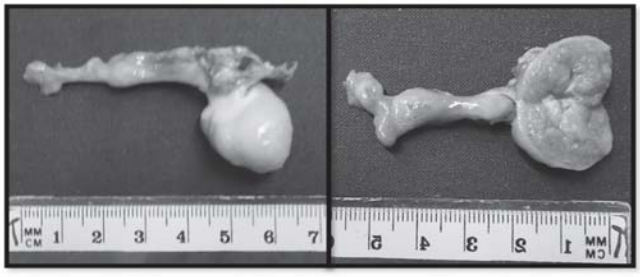

Figure 10. The right gonad measured 2.2 x 1.8 x 1.0 cm with smooth, tan capsule. On cut section, pink glandular tissue within with no areas of hemorrhage or necrosis.

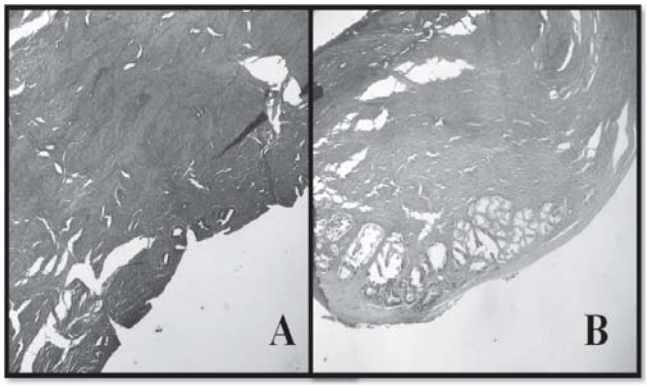

Figure 11. Histopathological examination of the uterus with atrophic endometrium and prostatic tissue within muscle. The endometrium on the inferior portion is thinned out showing few tubular structures (A). The endometrial lining is non-functioning and is consistent similar to those seen premenarcheal or postmenopausal states. Seen within the section of the uterus (B), are tubular, convoluted glands with pale-staining, basally located nuclei consistent with prostatic tissue.

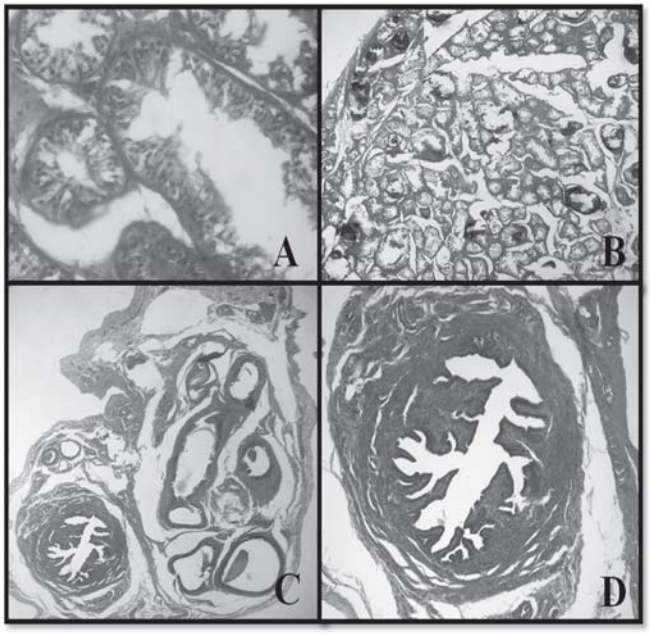

Figure 12. Histopathologic examination of the right gonad. Figure A is the high power view showing immature testis. The seminiferous tubules contain mostly round cells and large, immature nuclei with areas of calcification within. There are no gametes seen. Figure B is a low power magnification of the right gonad. Figure C is a low power view of the vas deferens and the epididymis. Figure D is a high power magnification of the vas deferens. The presence of less prominent branching pattern and increased stromal content are consistent with an immature stage.

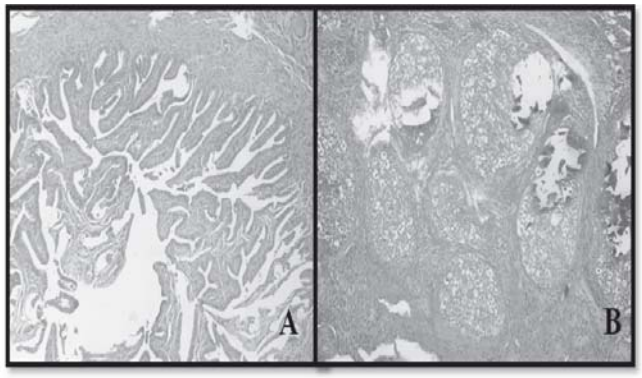

Figure 13. Histopathologic examination of the left gonad. Figure A is the immature left fallopian tube showing a lumen with less prominent branching pattern and thin stroma. Figure B is left testis showing hyperchromatic, Sertoli-only cells. The tubules are solid with no evidence of maturation.

The final diagnosis was 45,XO/46 XY Disorder of Sexual Differentiation probably Mixed Gonadal Dysgenesis; Undescended testes, bilateral; Hypospadias with chordee; status post pre-operative diagnostic cystourethroscopy and genitoscopy, total laparoscopic hysterectomy with bilateral gonadectomy, first stage repair of hypospadias.

The patient had an unremarkable post-operative course and was discharged stable. A comprehensive planning for the subsequent management of the patient was carried out by the multidisciplinary team with the goal of correction and restoration of function consistent with gender identity, hormonal induction of puberty, genetic counseling and continued psychosocial support for psychosexual maturation. Post-operatively, recombinant Growth Hormone supplementation was administered at a dose of 1. 34mg daily. Once the desired adult height is attained, testosterone supplementation will commence in order to attain pubertal maturation. Genetic counseling and screening for other conditions such as cardiovascular pathology and learning disabilities were made. Continuous psychosocial support for psychosexual adjustment was likewise rendered.

Discussion

Disorders of sexual development (DSDs), a condition of atypical development of the

chromosomal, gonadal, or anatomic sex occurs in 1 in 4500 live births.[1]

Classification

In 2005, the Chicago consensus conference introduced the term DSD and emphasized its potential negative consequences on psychosexual development, fertility and cancer risk.[2] It is currently classified into four main groups (Figure 14):

1) The 46,XX DSD patients are genetically female, with an overdeveloped genital tubercle (clitoris), no vaginal connection to the perineum and enlarged and merged genital folds. The internal genitalia are female and usually normal. It is most commonly due to Congenital Adrenal Hyperplasia (CAH)

2) The 46,XY DSD patients are genetically male, and may vary from those with normal appearing females to males with hypospadia and infertility. These patients may have underdevelopment of the genital tubercle (hypospadias and/or micropenis) with or without undescended gonads, with or without

Table 1 An example of DSD categorisation based on the Chicago consensus.

Category of DSD
1. Sex chromosome DSD
a. 45,X0/46,XY Mixed gonadal dysgenesis (MGD)
b. 45,X0/46,XY Partial gonadal dysgenesis
c. 46,XX/XY or 45,X0/46,XY Ovotesticular DSD
d. 45,X0 or 45,X0/46,XY (Turner's syndrome)
e. Seminiferous tubule dysgenesis: Klinefelter's syndrome (47,XXY)
2. 46,XX (DSD)
a. Androgen excess: (60%–70%)
i. CAH (vast majority)
1.21-Hydroxylase deficiency (95%)
2. 11β-Hydroxylase deficiency (5%)
3. 3β-Hydroxysteroid dehydrogenase deficiency
ii. Maternal androgens (very rare)
1. Endogenous: Virilising tumours in the mother
2. Exogenous (very rare)
b. Disorders of ovarian development
i. Ovotesticular DSD
ii. 46,XX testicular DSD (SRY translocation)
iii. Pure gonadal dysgenesis (e.g. SOX9 duplication)
c. Meyer–Rokitansky syndrome (Müllerian aplasia)
3. 46,XY DSD
a. Disorders of testicular development
i. Gonadal dysgenesis (Swyer syndrome = Pure, DAX-1 Duplication. SF-1 mutation)
ii. Ovotesticular DSD
iii. Bilateral vanishing testis/testicular regression syndromes
b. Disorders of androgen synthesis or action:
i. Leydig cell agenesis, unresponsiveness
ii. Enzyme deficiency:
1. StAR deficiency (lipoid adrenal hyperplasia)
2. 3β-Hydroxysteroid dehydrogenase deficiency
3. 17α-Hydroxylase deficiency
4. 17,20-Lyase deficiency
5. 17β-Hydroxysteroid oxidoreductase deficiency
6. 5α-Reductase deficiency
iii. Disorders of androgen-dependent target tissue
1. CAIS (testicular feminisation)
2. PAIS
iv. Persistent Müllerian duct syndrome
4. Others: Severe hypospadias and cryptorchidism, penile agenesis and cloacal exstrophy

Figure 14. The 2005 Chicago Consensus Classification system.

feminine remnants (mullerian structures). Within this group are patients with dysfunctional gonads (gonadal dysgenesis), impaired steroidogenesis (17 beta hydroxysteroid dehydrogenase deficiency), dysfunctional central hormonal control, and dysfunctional target tissues (androgen insensitivity; 5 alpha reductase deficiency).

3) The chromosomal abnormalities or mosaicisms are mostly represented by the 45,X0/46,XY individuals (mixed gonadal dysgenesis).

4) The rarest group is the ovotesticular DSD.

The patient falls under the third type, with both an abnormal 45 monosomy X chromosome and a normal 46,XY chromosome. Mosaicism (45, XO/46, XY karyotype) is the most common karyotype expressed in MGD and occurs in 1.7/ 10,000 pregnancies and about 60% of involved individuals have ambiguous genitalia.[3]

Pathophysiology

At 6–7 weeks of gestation, the paramesonephric duct (Mullerian duct) develops next to the mesonephric duct. If testes develop and secrete testosterone, the mesonephric (Wolffian) duct increases in size and differentiates into epididymis, vas deferens and prostate.[4] In 1990, Sinclair and colleagues identified the sex determining region Y (SRY) which, at approximately 45 days of gestation, triggers differentiation of the indifferent gonad into Sertoli cells. A glycoprotein secreted from the testicular Sertoli cells known as anti-Mullerian hormone (AMH) results in Mullerian duct regression. If testes do not develop, the mesonephric duct does not grow and eventually degenerates, whereas the paramesonephric duct proliferates and the fallopian tube, uterus and the upper third of the vagina develop.[4]

Mutations of the SRY gene, are the cause of XY sex reversal in approximately 10–15% of patients with gonadal dysgenesis, being most of these mutations localized in the open reading frame (ORF) of the gene. Canto and colleagues proposed that a 3‘ deletion was responsible for the abnormal gonadal development by diminishing the expression of SRY.[5]

Testosterone is derived from cholesterol and defect in the synthesis of cholesterol may result in DSD.[6] There are five enzymatic steps required in the conversion of cholesterol to testosterone. Specifically, deficiency of the enzyme 17,20-lyase, which converts 17α-OH pregnenolone and 17α-OH progesterone to DHEA and androstenedione respectively, result in individuals with variable phenotypes ranging from female to male with mild hypospadias. This enzymatic step occurs in gonadal tissue and therefore does not cause adrenal insufficiency.[6] This is the most likely deranged step in the patient since hormonal assays showed decreased testosterone and DHEAS levels thereby resulting in underdeveloped penis with hypospadia and bilateral undescended testes. The 17-OH progesterone levels are elevated secondary to preferential shunting of the pathway towards cortisol production. However, there was no manifestation of hypercortisolism in the patient.

The patients with mixed gonadal dysgenesis have one dysgenetic testis and one streak or absent gonad. The streak gonad, representing the most severe form of faulty testicular expression, does not produce enough testosterone. The dysgenetic gonad falls in the spectrum between streak and normal gonads.[7] Histopathologic examination of the patient's right gonad contained immature testis, vas deferens and epididymis, signifying lack of influence of testosterone. The patient's left gonad showed immature testis with Sertoli only cells and no spermatogonia, and ovarian tissue with no evidence of folliculogenesis. Likewise, the sole presence of Sertoli cells which secrete AMH lead to the persistence of Mullerian duct structures.

Typically, dysgenetic gonads are composed of immature hypoplastic seminiferous tubules, persistent stroma resembling that seen in the streak gonad but lacking primary ovarian follicles. If present, the ovarian-like component of a streak gonad is microscopic, has not developed beyond the primordial follicle and lacks reproductive capacity.[8] These qualities differentiate the streak gonad from the gonad of ovotesticular disorder or true hermaphrodite, which has the macroscopic

appearance of ovary or ovary and testis, advanced ovarian development histologically, and frequent function as evidenced by menstruation and reports of pregnancy.[7]

Undescended dysgenetic testes and streak gonads are highly predisposed to gonadal tumor formation. Manuel et.al. have shown that the incidence of tumor formation increases with age and reported that 10% of patients with mixed gonadal dysgenesis had tumors by age 20 years and 19% by age 30 years.[9] The most common tumor being gonadoblastoma which histologically, consists of aggregates of germ cells and small epithelial cells resembling immature Sertoli or granulosa cells. Leydig or lutein-like cells are present in two-thirds of the cases.[10] The predisposition of dysgenetic gonads for tumor formation may be the result of high levels of circulating gonadotropins (elevated luteinizing hormone in some, elevated follicle-simulating hormone in most).[7]

Diagnosis

Along with the initial laboratory investigations such as karyotype, hormonal assays and electrolytes, a detailed anatomical assessment is required to guide treatment. The accurate and detailed description of anatomical variants is also important to understand the role of the multiple genetic and biological mutations that are now being identified.

The genital tubercle is the embryonic structure that develops into the penis or clitoris and its description is of particular importance when assessing abnormalities such as hypospadias and assessing a micropenis. Initial clinical examination should include the Prader classification (Figure 15), a description of the phallus (length, width, presence of bend/chordee), the scrotum or labio-scrotal folds, and the presence or absence of a palpable gonad on either side.[11] The skin color and

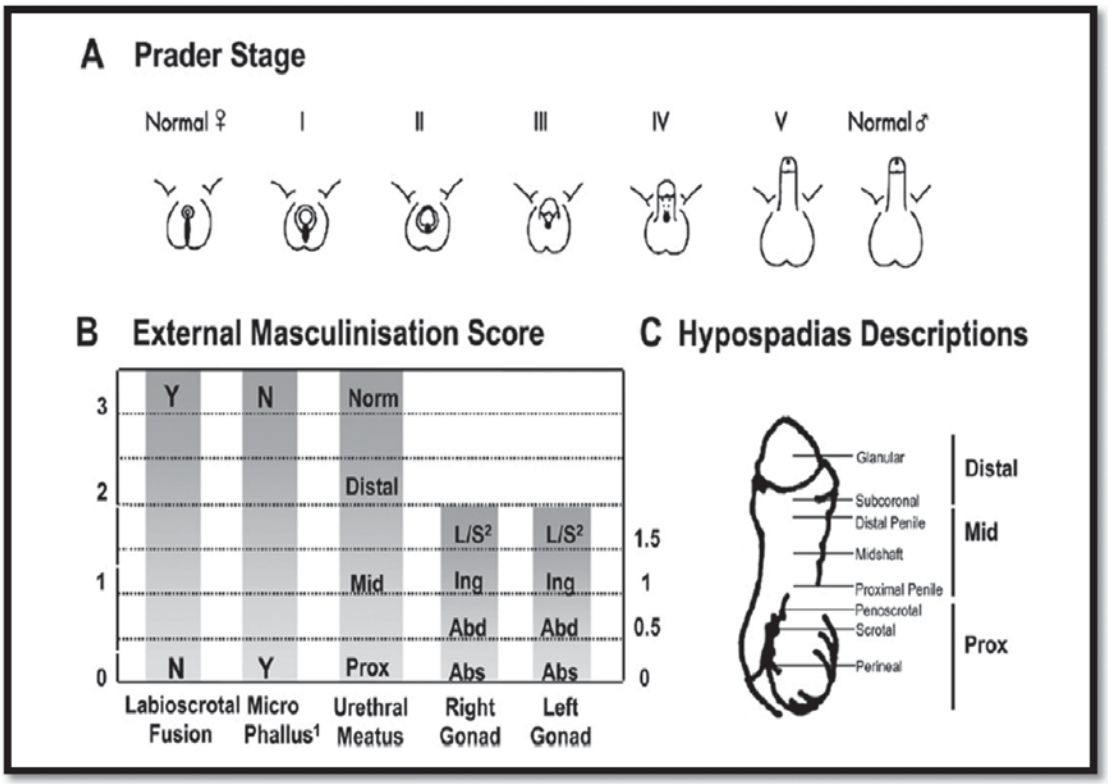

Figure 15. Scoring External Genitalia. A. The external genitalia can be objectively scored using the Prader staging system, which provides an overall score for the appearance of the external genitalia. B. Alternatively, each individual feature of the genitalia (phallus size, labioscrotal fusion, site of the gonads and location of urethral meatus) cab n e individually scored to obtain the External Masculinisation Score (EMS).

rugae should be recorded, and the location and number of orifices present on the perineum. Based on this classification, the index patient falls under Stage 4. The genitalia was male looking, with an empty scrotum and a micropenis with chordee. A small ventral urethral opening at base of the phallus was also appreciated.

The majority presents in the neonatal period however some cases may present later and include: inguinal hernia in a female, virilization in a female, primary amenorrhea, breast development in a male and delayed or incomplete puberty.[11]

Imaging

Evaluation of the internal genital organs and gonads is crucial for devising surgical strategies for patients with DSD. MRI and ultrasound are considered equally sensitive and are usually indicated in the evaluation of Mullerian duct derivatives.[12] However, MRI is more superior in the evaluation of gonads, although streak gonads are still difficult to detect.[13]

Routine ultrasonography with or without MRI, as an adjunct to the evaluation by diagnostic laparoscopy, may be done for complex cases.[12] Laparoscopy allows excellent visualization compared to ultrasound among children with DSD.[14] In cases of non-palpable testis, laparoscopy provides superior diagnostic capabilities compared to other imaging modalities.[12] In our index patient, the presence of uterus was readily documented by a transrectal ultrasound however, the gonads were visualized only during laparoscopy. MRI was not done in this case due to financial constraints.

Management

Avoiding complications related to the altered anatomy and function, meeting parents' expectations and helping the individual achieve future satisfactory sexual function consistent with their gender identity are the three main objectives of the DSD team management. It is clearly a great challenge, which can best be fulfilled if an experienced multidisciplinary team is available to advise the patient and his/her family.

A. Surgical Management

For children raised as males, one must consider the degree of virilization of the external genitalia and the presence or absence of an intrascrotal testis.[7] All patients should undergo early intra-abdominal gonadectomy and resection of mullerian structures. Correction of chordee, staged repair of hypospadias is required, with or without orchiopexy. The outcome depends on the degree of hypospadias and the amount of erectile tissue.[15] After thorough counseling, the patient and his family decided to have him reared as male which necessitated repair of the hypospadia and removal of the uterus. Gonadectomy was required to protect the patient from development of a possible gonadal malignancy. Definitive gender assignment should be made as early as possible in these patients, as in all patients with ambiguous genitalia.[16] The option of delaying the surgery and allowing the patient to undergo normal onset of puberty and future fertility was weighed against the risk of possible malignant transformation and the stigma from genital ambiguity. The decision by consensus was towards early intervention with the least impairment in quality of life or gender development.

The patient is still for second-stage repair of hypospadia, which consists of urethroplasty to allow him to urinate properly and in a more gender-appropriate manner. Testicular implants may be surgically placed if the patient desires in the future.

B. Medical Management

Hormonal induction of puberty is necessary to attain adult height. Intramuscular depot injections of testosterone are administered at the expected age of puberty. Our patient is still receiving his Growth Hormone therapy. Once the desired height is reached (95th percentile for age), Testosterone therapy will be started.

C. Psychosexual Management

In a long-term follow-up done by Kojima et.al, although DSD males usually have an undeveloped penis and testis and have hypergonadotropic hypogonadism or eugonadism, most may have

male sexual potential and male sex identity. This means that testicular function in DSD males may be insufficient for masculinization of the fetal external genitalia but sufficient to achieve male sexual function and develop male sex identity.[17] The ultimate goal in any management strategy is to provide a framework that will allow the affected child to develop into a well-adjusted psychosocially stable individual who identifies with and is happy in the assigned sex.[6] Factors that influence sex assignment include diagnosis, genotype, genital appearance, surgical options, need for lifelong replacement therapy, potential for fertility, views of the family, and sometimes circumstances relating to cultural practices.[6-8] In a study by Szarras-Czapnik involving long-term follow-up of patients with MGD, although surgical and hormonal treatment gave good results, our findings some patients did not have a strong gender identity. Gender dysphoria was identified in patients who underwent gender reassignment surgery, hence the role of continued counseling cannot be undermined.[21]

Conclusion

Presented here is a case of a 12-year old child with Mixed Gonadal Dysgenesis who presented with ambiguous genitalia and underwent pre-operative diagnostic cystourethroscopy and genitoscopy, total laparoscopic hysterectomy with bilateral gonadectomy, first stage repair of hypospadias. Management of these disorders required careful planning involving a multidisciplinary team, emphasizing that technical or surgical expertise is not the only requirement in the appropriate management of theses cases. Despite delayed management due to financial constraints, the patient benefited from a thorough and multidisciplinary approach consisting of: prevention of malignancy (gonadectomy), restoration of function (repair of hypospadia), correction of deficits (growth hormone and testosterone supplementation) and psychological support (psychotherapy). Laparoscopic management was the best approach for this patient because it provided minimally invasive surgery, which enabled all necessary procedures, including evaluation, biopsy, and gonadectomy, for diagnosis and treatment.

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