

Byoung Uk Park, MS VII
Gillian Lieberman, MD

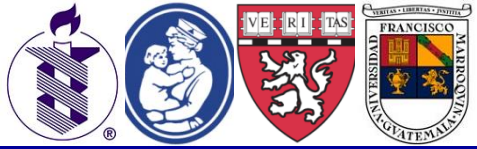
Sep – Oct 2015

Pseudohermaphroditism due to Congenital Adrenal Hyperplasia

Byoung Uk Park
Universidad Francisco Marroquín

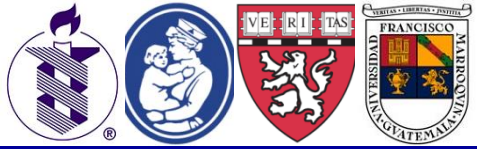
Gillian Lieberman, MD

October 19, 2015



Agenda

1. Case Presentation
2. Image Findings
3. Discussion
 - I. Definition/Incidence
 - II. Pathogenesis of Disorder of Sexual Differentiation associated to CAH
 - III. Diagnosis/Radiographic Modalities
 - IV. Treatment
4. Take Home Points
5. Acknowledgements
6. References



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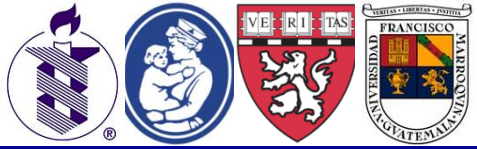
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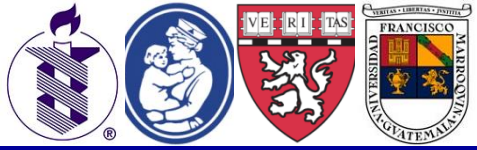
Our Patient: Case presentation

13-month old female, who presented with:

- Clitoromegaly
- Partial fusion of the posterior labioscrotal folds
- Single aperture in urogenital area



Courtesy of Dr. David Diamond

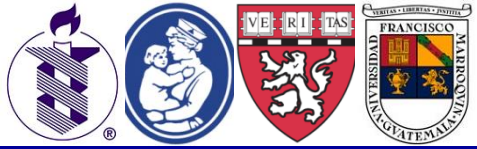


Our Patient: History

Patient was referred with following information:

- Diagnosed:
 - ***Congenital Adrenal Hyperplasia***
 - Due to:
 - High level of 17-hydroxyprogesterone
 - ***Genital Ambiguity***
 - ***US abdomen + Pelvis: normal***

...For evaluation and surgical management.

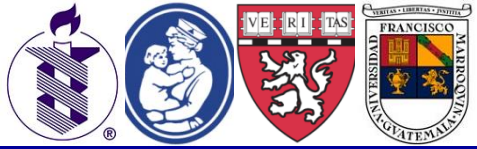


Our Patient: Evaluation

First step of evaluation:

- VCUG

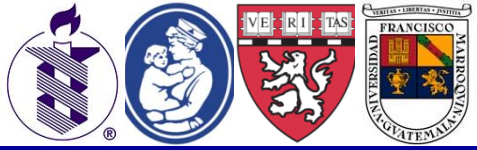
Voiding – CystoUrethroGram



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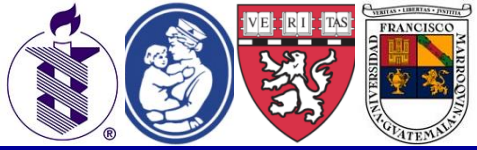
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But... What is VCUG?



VCUG: General Information

- Gold standard method of detecting Vesicoureteric reflux.
- Continuous radiographic test with contrast to assess and evaluate:
 - Kidney
 - Ureter
 - Bladder
 - Urethra



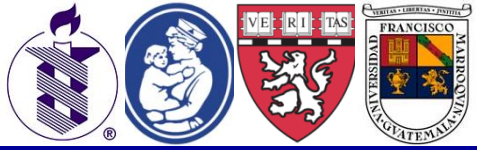
VCUG: General Information

- Surgical work-up to display urogenital anatomy:
 - type of urethra
 - presence of vagina / cervix / urogenital sinus
 - fistulous communications
- Most of the time it is *all that is necessary* for anatomic evaluation of the urinary tract.
 - eliminates the need for endoscopy, CT and MRI
 - reserved for inconclusive findings

•S. Singh, P. Singh, R.J Singh. Persistent Urogenital Sinus. J. Anat.Soc. India 59(2) 242-244 (2010)

•Vallerie A, Breech L. Update in Mullerian anomalies: diagnosis, management, and outcomes. Current Opinion in Obstetrics & Gynecology. Oct 2010; 22(5); 381-387

•Miranda D, Duarte R, Matos H, et al. Case 632. Female pseudohermaphroditism. Radiological Case Database. 2011, Feb.9



VCUG: General Information

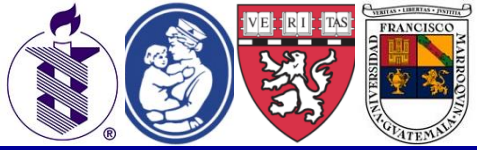
Complications

- Pain: Insertion of catheter / Post-Void
- Urinary tract infections
- Reaction to Iodine-based dye

Radiation? = the amount of background radiation a person gets in 9 days

Use of Midazolam

- is effective with no apparent effect on voiding dynamics.
- causes amnesia, reduces distress



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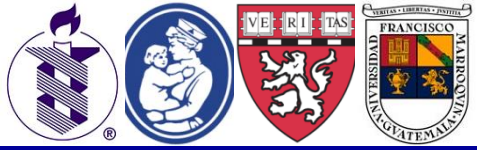
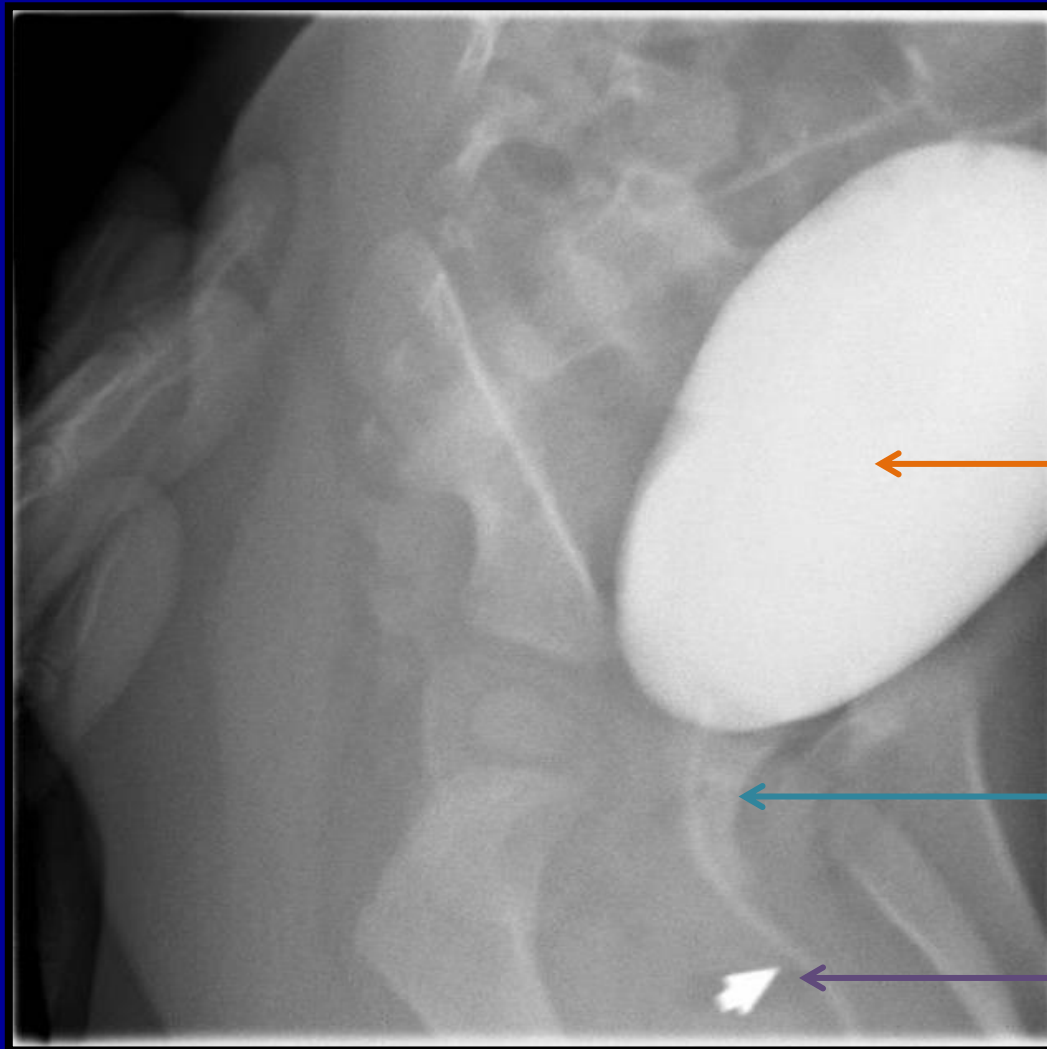


Image: Our Patient: VCUG with full Bladder



Bladder, filled with contrast

Urethra

Arrow-Shaped Metallic Marker placed on perineal opening

VCUG, Lateral view; with perineal opening marker. Filled Bladder.

Courtesy of Dr. Mei Mei Chow

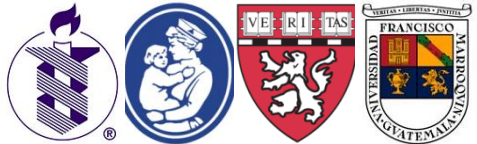
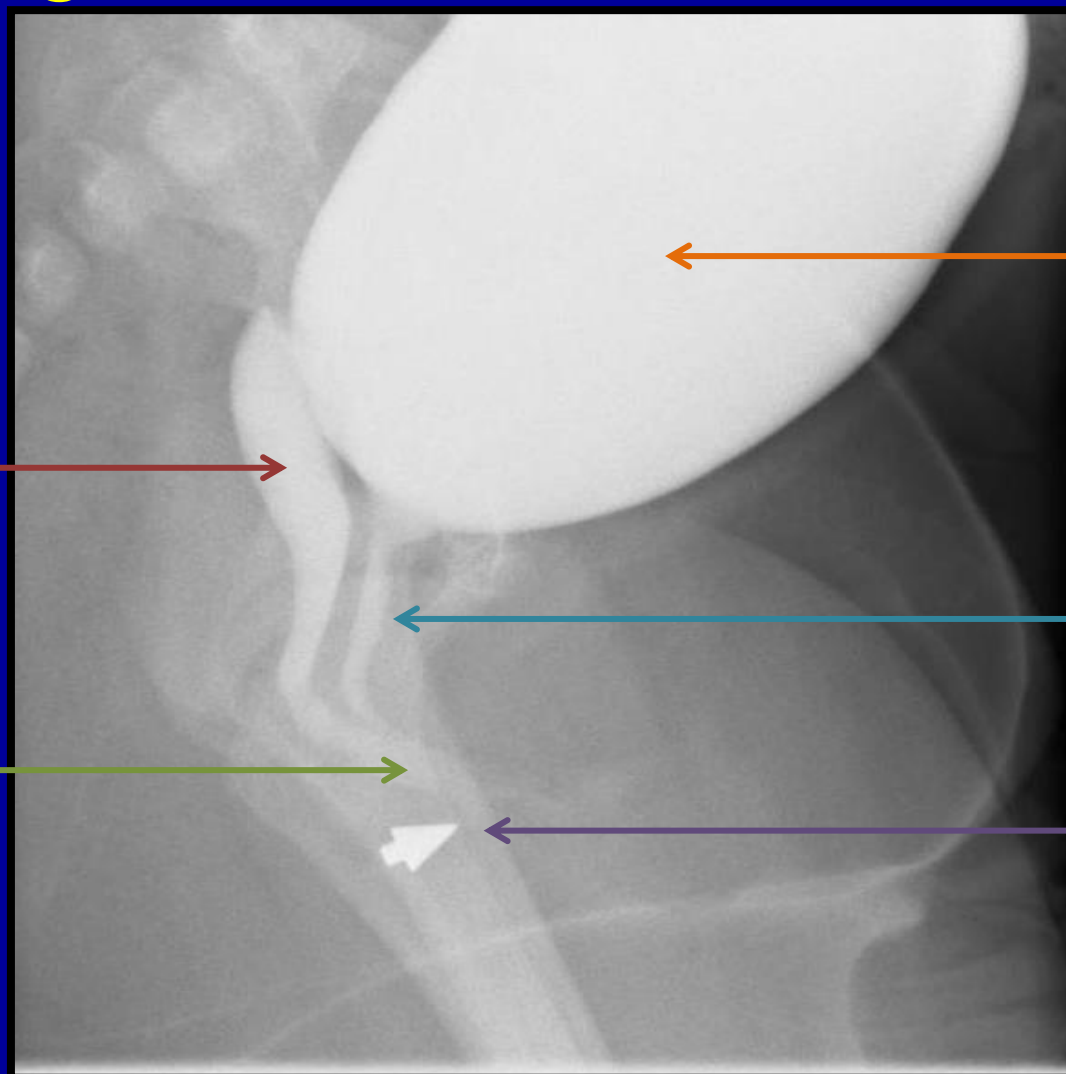


Image: Our Patient: VCUG; Voiding



Bladder, filled with contrast

Vagina Vault

Urethra

Urogenital Sinus

Arrow-Shaped Metallic Marker placed on perineal opening

VCUG, Lateral view; with perineal opening marker.
During Void.

Courtesy of Dr. Mei Mei Chow

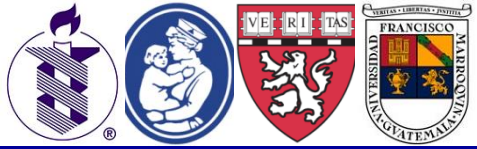
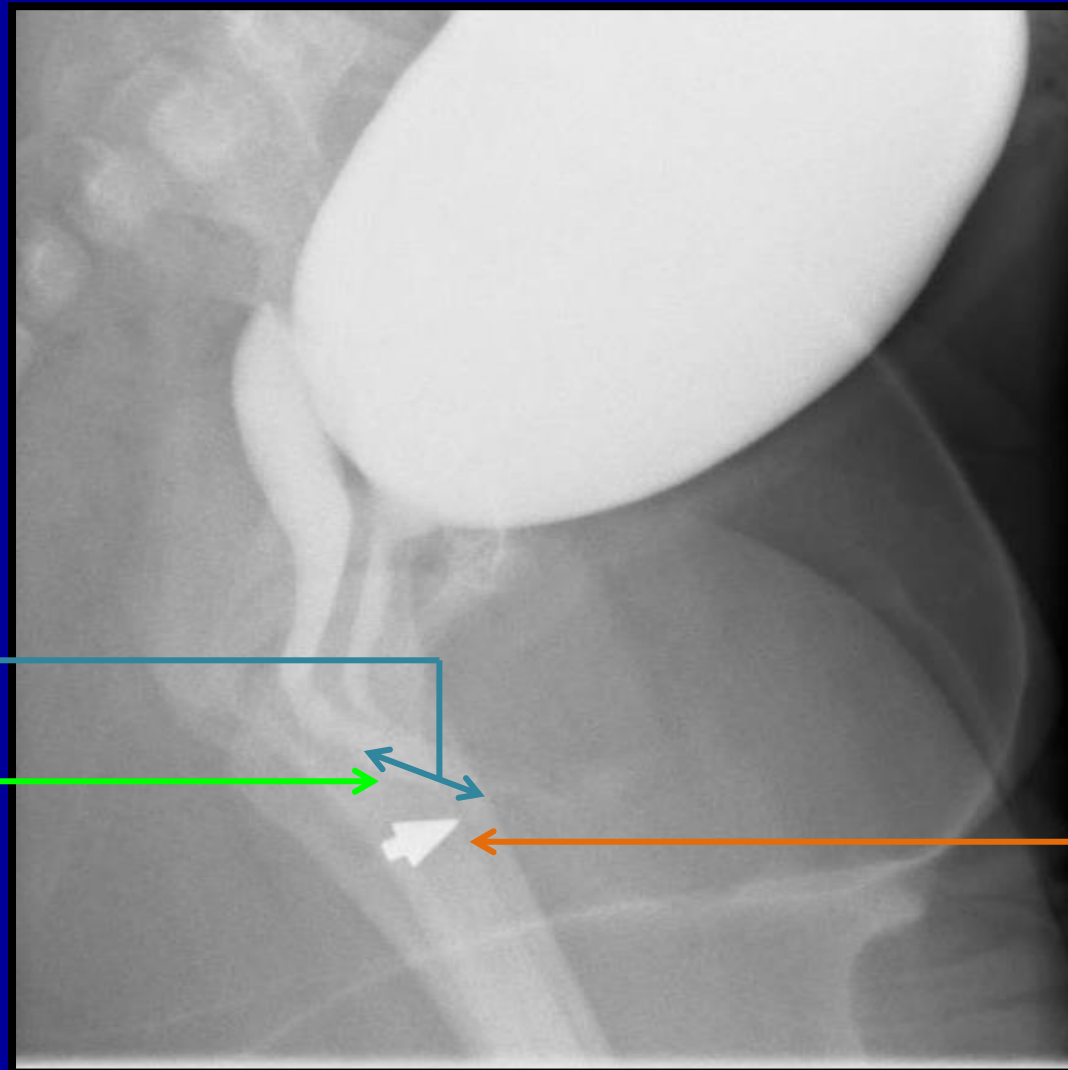


Image: Our Patient: VCUG; Voiding



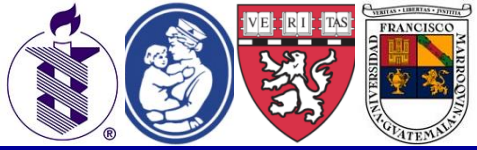
Distance: 1.1cm

Urogenital Sinus

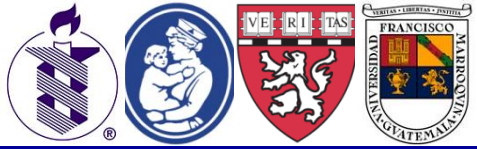
Arrow-Shaped
Metallic Marker
placed on perineal
opening

VCUG, Lateral view; with perineal opening marker.
During Void.

Courtesy of Dr. Mei Mei Chow

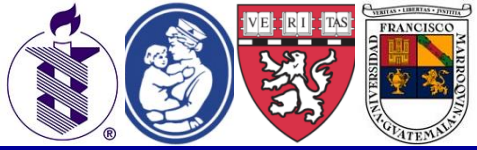


- So the finding represents the presence of Urogenital Sinus.
- But... What is ***Urogenital Sinus*** ?



Urogenital sinus Abnormality

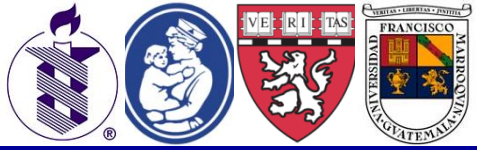
- Defect present at birth, vagina and urethra open into a common channel.
- This structure may persist in patients with Congenital Adrenal Hyperplasia, due to excessive androgens exposure.
- 2 types: Low vs. High



Our Patient: Final Diagnosis

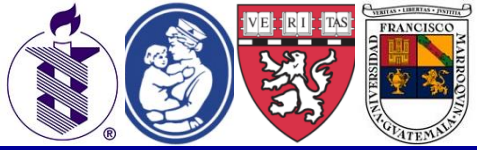
Diagnosis:

- Congenital Adrenal Hyperplasia
 - Disorder of Sexual Differentiation
 - Urogenital sinus
 - Clitomegaly

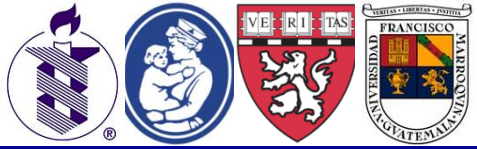


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What are some of possible causes of ***Disorder of Sexual Differentiation*** ?



Disorders of Sexual Differentiation

Sex chromosome

46,XX

46, XY

X0

XXY

Maternal
Androgens

Androgen
Excess

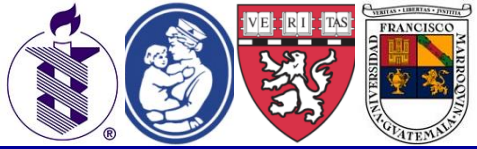
D. Ovarian
Develop,

D.
Testicular
Develop.

D.
Androgen
Synthesis

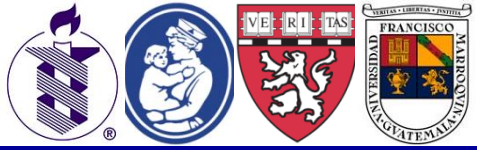
D.
androgen-
dependent
target
tissue

D. = Disorder of; Develop. = Development



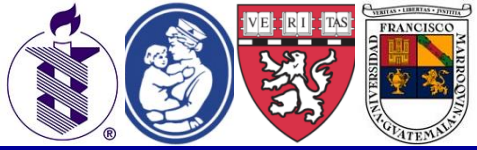
CAH and DSD

- Congenital Adrenal Hyperplasia (CAH) in Female
 - Most common cause disorder of sexual differentiation (DSD)
 - represents ~60-70% of ambiguous genitalia in newborn
- Incidence: 1:14500



CAH and DSD

- Most cases are due to autosomal recessive deficiency of:
 - *21-hydroxylase*
 - Which causes steroid hormone synthesis to be diverted towards the androgen pathway
 - Females: High levels of androgens causes virilization of the external genitalia.



CAH and DSD

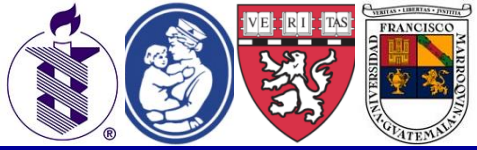
Female:

- Around 12 weeks of gestation, there is separation of Vagina and Urethra
- ***This is a Non-hormone Dependent Process***
 - But if there is exposure to androgens, female fetus can have:
 - Labial fusion / Phallic urethra / Urogenital sinus
 - Clitoral enlargement / Scrotalisation of the labial folds.

Image: Companion Patients: Ambiguous Genitalia



M. El-Sherbiny. Disorders of sexual differentiation: 1. Genetics and pathology. Arab Journal of Urology. March 2013; 11(1):19-26



Urogenital Sinus: Diagnosis/Radiographic Modalities

- Imaging plays an important role in depicting the internal organs and urogenital anatomy.
 - Cystourethrogram / Genitogram (lateral view)
 - Endoscopy / Cystoscopy
 - US
 - CT / MRI

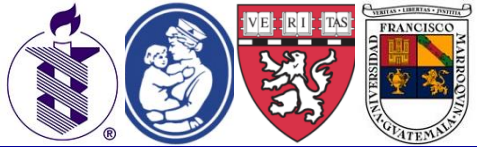
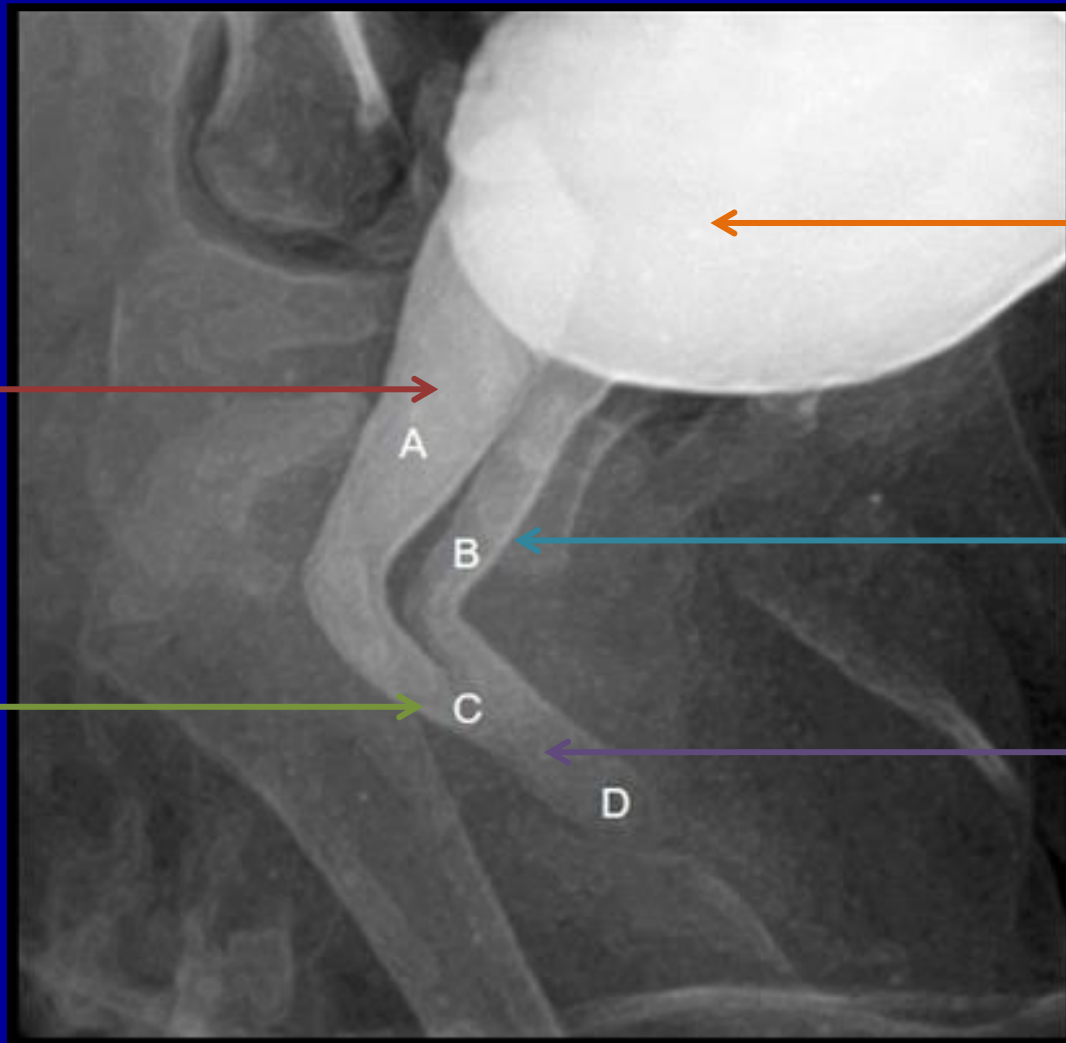


Image: VCUG: Companion Patients 2, Urogenital Sinus



Bladder, filled with contrast

Urethra (B)

Urogenital Sinus (D)

Vagina (A)

Confluence of Urethra and Vagina (C)

VCUG, Lateral view; Caffey's Pediatric Diagnostic Imaging. Tenth Edition. 2004, Elsevier Inc. pp 1967-1978

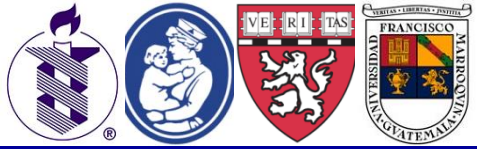
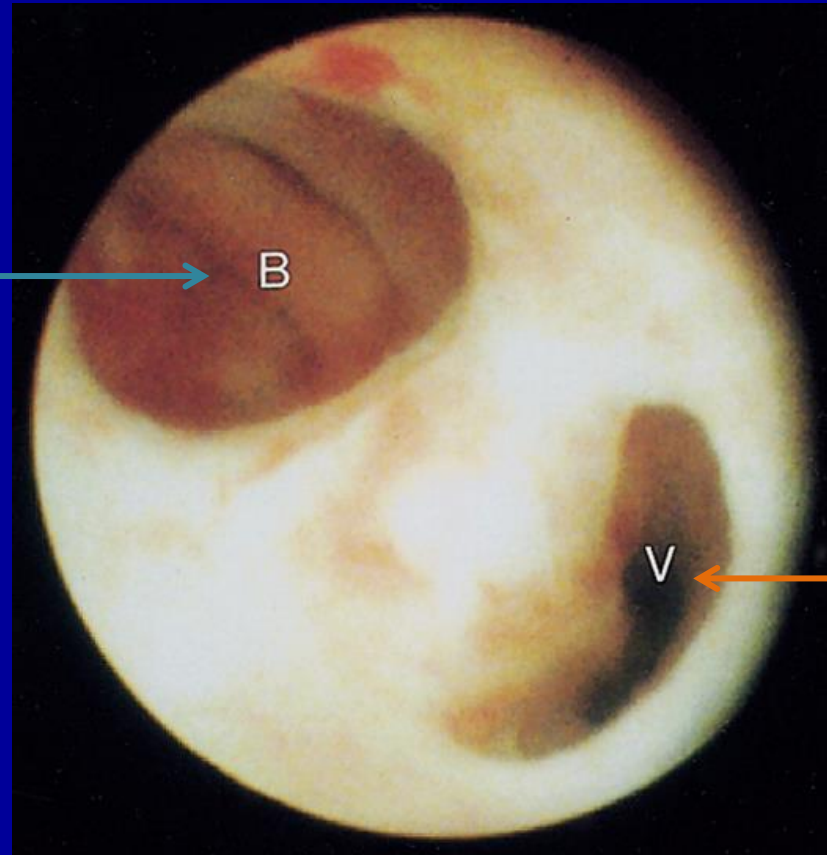


Image: Cystoscopy: Companion Patients 2, Urogenital Sinus



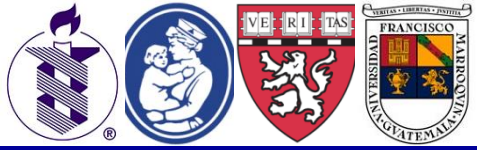
Bladder (B)

B

V

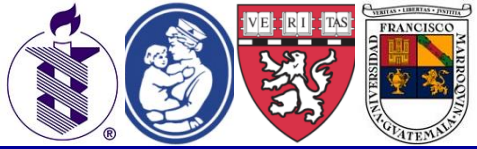
Vagina (V)

Cystoscopy, camera introduced in to the urogenital sinus; T. Berrocal, P. Lopez, A. Arjonilla, Anomalies of the Distal Ureter, Bladder, and Urethra in Children: embryologic, Radiologic, and Pathologic Features. RadioGraphics 2002 22:5, 1139-1164



Urogenital Sinus: Role of Radiologist

- Provide correct/full name diagnosis
- Provide information to guide surgical approach.
- Description of Genital ambiguity and urogenital sinus should include:
 - Degree of masculinization
 - Phallic Size
 - External genital appearance
 - Location of Vaginal Confluence



Urogenital Sinus: Role of Radiologist

PVE classification:

- helps decide surgical approach and analyze surgical outcomes. New method of description, since 2005.

P :Phallic length and width.

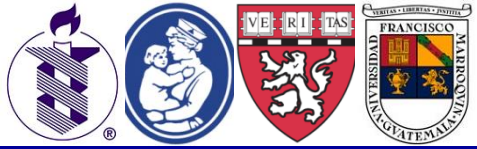
- measured in cm in flaccid state

V: Vaginal Location

- Distance from the bladder neck to the confluence and *length of the common urogenital sinus*.

E: External genital appearance.

- Prader number

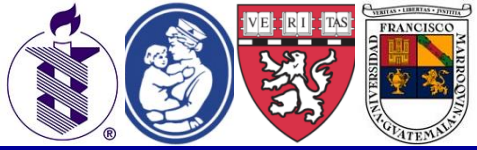


Urogenital Sinus: Treatment

- Feminizing surgery (within 18 months of life)
 - genitoplasty (Clitoral reduction + vaginoplasty)
- Cosmetic results -> Good

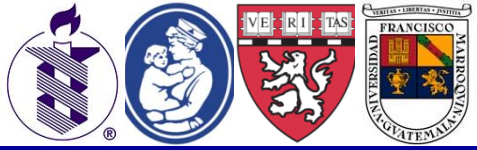
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• Sircili MHP, Mendonça BB de, Denes FT, Madureira G, Bachega TASS, Queiroz e Silva FA de. Anatomical and functional outcomes of feminizing genitoplasty for ambiguous genitalia in patients with virilizing congenital adrenal hyperplasia. *Clinics*. 2006;61(3):209-14.



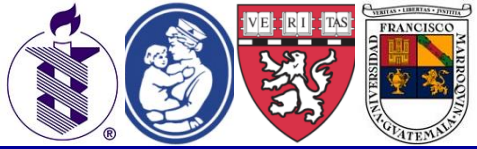
Our Patient: Plan

- With the information obtained from the VCUG, patient was planned to undergo surgery in 2 weeks.
- Due to the short length of the urogenital sinus (1.1cm), she was expected to have good outcome with low risk of complications.



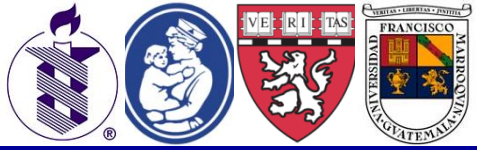
Take Home Points

- We discussed case presentation of female patient with Congenital Adrenal Hyperplasia and Disorder of Sexual Differentiation, Urogenital Sinus.
- You saw images of VCUG, showing the presence of Urogenital Sinus.
- We discussed about Congenital Adrenal Hyperplasia and how it causes Disorder of Sexual differentiation.
- We discussed about different radiographic studies that can be used to assess urogenital sinus; and the important role of radiologist.
- You saw images of physical examination, VCUG and cystoscopy of other companion patients with Urogenial Sinus.



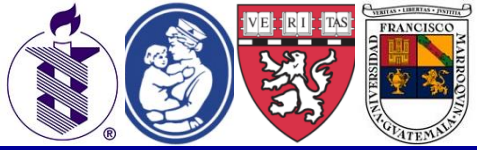
Acknowledgements

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 - Director of Medical Student Radiological Education at Harvard Medical School; co-director of radiologic education at BIDMC.
- **Dr. Mei Mei Chow**
 - Director, Genitourinary Imaging at BCH, Assistant Professor of Radiology, Harvard Medical School.
- **Dr. David Diamond**
 - Urologist-in-Chief at BCH; Professor of Surgery (Urology), Harvard Medical School.
- **Dr. Ellis Collin**
 - Third year Resident– Radiology Department , Mount Auburn Hospital.
- **Katie Armstrong**
 - Manager, Medical Education Programs of Medical Student Radiological Education at Harvard Medical School.



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