Müllerian Anomalies – Managing the Unexpected
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Objectives
• Review normal embryologic development of the female reproductive system
• Describe the presentation, evaluation, and management of obstructive anomalies
• Describe the presentation, evaluation and management of non-obstructive anomalies
• Describe the presentation, evaluation and management of complex anomalies
Embryologic Development of the Reproductive System

- Gonads are initially undifferentiated
- Embryo initially has two paired ductal systems
- Mesonephric (Wolffian) ducts → Male system
- Paramesonephric (Müllerian) ducts → Female system

Embryologic Development of the Male Reproductive System

- Müllerian inhibiting substance (MIS) → regression of the paramesonephric ducts
- Testosterone → mesonephric duct development (vas deferens, seminal vesicles, epididymides)

Embryologic Development of the Female Reproductive System

- No testosterone → Mesonephric ducts regress
- No MIS → Müllerian ducts persist
- WNT gene promotes Müllerian duct development
Embryologic Development of the Female Reproductive System

- Developing Müllerian ducts grow caudally to fuse with the urogenital sinus at 8 weeks
- Development is closely linked to renal system
- Müllerian ducts give rise to the fallopian tubes, uterus, cervix, and upper vagina
- Urogenital sinus gives rise to lower vagina and hymen
- Vaginal development is dependent on the Müllerian ducts and estrogen

Development of the Uterus and Vagina

http://www.pediatricurologybook.com

https://embryology.med.unsw.edu.au
Müllerian and Uterovaginal Anomalies

- Vertical Fusion Defects
- Lateral Fusion Defects
- Complex Defects
Müllerian and Uterovaginal Anomalies

**Vertical Fusion Defects**

- Arise from inappropriate canalization of the urogenital sinus and/or incomplete vertical fusion of the sinus with the Müllerian system
- Examples include imperforate hymen, hymenal variants, transverse vaginal septa, vaginal atresia, cervical atresia
- Commonly described as obstructive anomalies

**Lateral Fusion Defects**

- Arise from incomplete lateral fusion of the Müllerian ducts
- Examples include unicornuate uterus, bicornuate uterus, uterine didelphys, longitudinal vaginal septum
- Commonly described as non-obstructive anomalies

**Complex Defects**

- Defects in both vertical and lateral fusion events (e.g., Obstructed Hemivagina and Ipsilateral Renal Agenesis)
- Failure of Müllerian duct development (e.g. Müllerian agenesis and disorders of sexual differentiation)
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Obstructive Anomalies- Presentation

- Result from the obstruction of menstrual efflux at any level of the genital system
- Classically present with primary amenorrhea
- Evaluation begins with a detailed history and physical

Obstructive Anomalies- Evaluation

- History of normal thelarche and adrenarche, primary amenorrhea
- Cyclic abdominal or pelvic pain
- May be able to diagnose with limited pelvic exam
- Hematocolpos and/or hematometrocolpos on imaging
Obstructive Anomalies – Evaluation
Hematocolpos

• Classic presentation of primary amenorrhea
• No hymenal opening, intact hymen may be bulging or blue-tinged secondary to retained menses
• If unclear diagnosis, ultrasound or MRI can confirm

Hematometrocolpos

- If unclear diagnosis, ultrasound or MRI can confirm
Obstructive Anomalies- Imperforate Hymen

Management

- Surgically excised
- Exam under anesthesia with a cruciate incision of the hymen
- Evacuation of hematocolpos
- Rarely associated with upper tract anomalies

Obstructive Anomalies- Imperforate Hymen

Management- Hymenectomy

https://www.youtube.com/watch?v=VHmlfrGXXX8

Obstructive Anomalies- Hymenal Variants

- Not completely obstructive
- Commonly present with inability to use a tampon or pain with attempts at intercourse
- Require surgical excision
**Obstructive Anomalies- Transverse Septum**

**Presentation and Evaluation**
- Commonly present with primary amenorrhea, may present in neonates
- Septum most commonly at the upper third of vagina
- May not be readily apparent on external exam
- Ultrasound or MRI to determine thickness and confirm presence of cervix

**Management**
- Surgically excision is standard of care
- Requires anastomosis of vaginal mucosa to prevent stricture formation
- May require post-operative dilators
- Rarely associated with upper tract or renal anomalies

**Obstructive Anomalies- Vaginal Atresia**

- Variable timing of presentation, related to extent of atresia
- Partial atresia may be treated similar to transverse septum
- Complete atresia requires grafting
Obstructive Anomalies - Cervical Atresia

- May occur with or without vaginal agenesis
- Presents earlier than other obstructive forms
- Imaging required to distinguish
- May require multi-stage surgical approach

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Non-Obstructive Anomalies

- Due to failure of development of one of the Müllerian ducts, failure of ducts to appropriately fuse, or failure of resorption of intervening septum
- Commonly asymptomatic, incidentally identified
- Identified during evaluation of women with recurrent pregnancy loss or other poor obstetric outcomes
- Diagnosed with ultrasound, MRI, hysteroscopy, 3D ultrasound
- Associated with renal anomalies
Non-Obstructive Anomalies

- Common in infertile women, increased incidence of endometriosis
- Poor obstetric outcomes (miscarriage, stillbirth, preterm birth)
- 40% associated with renal anomalies

Unicornuate Uterus

- Complete duplication
- Associated with longitudinal vaginal septum
  - pain with intercourse
  - inability of tampons to control menstrual flow
- Duplication of vagina on exam

Uterine Didelphys

- Two Cervices
- Vaginal Septum
- Complete duplication
- Associated with longitudinal vaginal septum
  - pain with intercourse
  - inability of tampons to control menstrual flow
- Duplication of vagina on exam
Non-Obstructive Anomalies

Uterine Didelphys

- Complete duplication
- Associated with longitudinal vaginal septum
  - pain with intercourse
  - inability of tampons to control menstrual flow
- Duplication of vagina on exam

Bicornuate Uterus

- Secondary to partial fusion of Müllerian ducts
- Single cervix and single vagina
- Typically associated with normal pregnancy outcomes

Septate Uterus

- Degree of septum variable with variable impact on pregnancy loss
- May be associated with a longitudinal vaginal septum
- In cases of recurrent pregnancy loss, metroplasty improves future outcomes
Non-Obstructive Anomalies
Longitudinal Vaginal Septum

- May occur in isolation, more commonly associated with uterine didelphys
- Presents with dyspareunia, tampon failure or dystocia at the time of vaginal delivery
- Treatment is surgical excision

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Complex Anomalies

- Obstructed Hemivagina and Ipsilateral Renal Agenesis (OHVIRA)
- Müllerian Agenesis
- Disorders of sexual differentiation
Obstructed Hemivagina and Ipsilateral Renal Agenesis (OHVIRA)

- Bicornuate uterus with unilateral obstruction, ipsilateral renal agenesis
- Presents after menarche with worsening dysmenorrhea
- May be suspected on exam
- Confirmed with ultrasound and/or MRI

Management: Excision of Obstructing Hemivagina

http://radiopaedia.org/articles/herlyn-werner-wunderlich-syndrome

http://www.youtube.com/watch?v=zDK_qMGEFKI
Uterine Aplasia

- Absent uterus, cervix and vagina
- Present with primary amenorrhea
- On exam, normal external genitalia with vaginal dimple or blind vaginal pouch
- Imaging confirms absence of upper genital structures
- Karyotype is critical in distinguishing Müllerian agenesis from disorders of sexual development

Müllerian Agenesis (MRKH)

- Absent uterus, cervix and vagina, secondary to failure of development of Müllerian system
- Karyotype is XX
- Ovaries are present as are possibly fallopian tubes and rudimentary uterine horns
- Renal anomalies are common
- Counseling is central to therapy
- Vaginal creation through dilator use

http://youngwomenshealth.org/
Müllerian Agenesis

Case 1
Pt is a 15 year old female who presents with primary amenorrhea

History
- thelarche at age 12
- crampy abdominal pain

Past Medical/Surgical History
- noncontributory

Dx: Imperforate Hymen  Tx: Cruciate excision
Case 2
Pt is a 15 year old female who presents with primary amenorrhea and severe abdominal pain

History
- thelarche at age 12
- initially intermittent, now constant abdominal pain

Past Medical/Surgical History
- noncontributory

Case 2
Pt is a 15 year old female who presents with primary amenorrhea and severe abdominal pain

Primary amenorrhea, severe pelvic pain, normal hymen

Differential Dx: Transverse Septum, Atretic vagina
Tx: Surgical excision and reanastomosis of mucosa
Case 3
Pt is a 16 year old female who presents with pain with tampon insertion

History
- thelarche at age 12
- menarche at age 13
- regular, predictable cycles

Past Medical/Surgical History
- noncontributory

Dx: Septate Hymen  Tx: Excision of septum

Case 4
Pt is a 15 year old female who presents with primary amenorrhea

History
- thelarche at age 12

Past Medical/Surgical History
- history of inguinal hernia repair
Case 4
Pt is a 15 year old female who presents with primary amenorrhea

Primary amenorrhea, secondary sexual characteristics, blind ending vaginal pouch

Differential Diagnosis
  - Müllerian Agenesis (MRKH)
  - Complete Androgen Insensitivity

Next steps in evaluation:
  - Karyotype  XX
  - Testosterone  Female Range

Dx: Müllerian Agenesis
Tx: Counseling, vaginal dilation
Case 5
Pt is a 17 year old female who presents with dysmenorrhea

History
- thelarche at age 11
- menarche at age 12
- persistent pain despite OCPs

Past Medical/Surgical History
- unilateral renal agenesis

Physical Exam
- single cervix, vaginal bulge

Dx: OHVIRA
Tx: Excision of hemivagina

Resources