Emergencies in Pediatric and Adolescent Gynecology

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Objectives

• Be able to evaluate vulvovaginal bleeding in the ER and distinguish between hormonal, hematologic, and structural causes of vulvovaginal bleeding in children

• Recognize the clinical and radiologic findings associated with adnexal torsion and be able to differentiate between torsion and other causes of abdominal pain in children and adolescents

• Identify obstructed Müllerian anomalies and the anatomical defects associated with hematocolpos
Evaluation of the prepubertal child

- Lithotomy
- Frog-legged
- Knee to chest
- Vaginoscopy
- Colposcopy
- Killian nasal speculum

Evaluation of the adolescent vulva and vagina

- Manual
- Vaginoscopy
- Colposcopy

Prepubertal vestibule
Normal hymenal variations

Vaginal Bleeding

Non gynecologic

Hormonal

Dermatologic

Traumatic

Structural

Infectious

pregnancy

malignancy
**Traumatic genital injuries**

- Accidental trauma
- Burns
- Sexual abuse
- Coital injuries
- Self manipulation

**Accidental genital injuries**

- 0.4-8% of all pediatric injuries are genital injuries, 56% female
- Mean age at injury is 7 years
- 43% lacerations
- 42% contusions/abrasions
- 2.8% hematomas


**Mechanism of accidental genital injuries**

**Straddle injuries**
Soft tissues of the vulva are compressed between an object and the boney pelvis resulting in ecchymoses, abrasions, lacerations, or hematomas

**Accidental penetrating injuries**
Piercing of the vulva, vagina, urethra, bladder, anus, or rectum with a sharp or pointed object

**Accidental vaginal insufflation injuries**
Pressurized water enters the vagina causing over distension of the vaginal walls resulting in tearing

**Crush or shear injuries**
Crush injuries can result in fragments of bone penetrating into the vagina or lower urinary tract; shear injuries can result from rapid abduction of the lower extremities
Animal or human bites

- Irrigate with 1% povidine-iodine solution
- Wound debridement
- Antibiotic prophylaxis
- Tetanus vaccine for mammalian bites
- Rabies immunization

Assessment of vulvar injury

- History
- Examination
- Valsalva
- Vaginal lavage
- 2% lidocaine jelly
- Conscious sedation
- Examination under anesthesia

Classification for genital injuries in female children

<table>
<thead>
<tr>
<th>Genital injury score</th>
<th>Extent of injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Isolated genital injury distal to hymen</td>
</tr>
<tr>
<td>II</td>
<td>Isolated genital injury including hymen</td>
</tr>
<tr>
<td>III</td>
<td>Isolated genital injury including vagina</td>
</tr>
<tr>
<td>IV</td>
<td>Hymenal or vaginal injury plus partial tear of anorectum</td>
</tr>
<tr>
<td>V</td>
<td>Vaginal injury plus complete tear of anorectum</td>
</tr>
</tbody>
</table>

Abrasions

Ecchymosis and petechiae

Laceration

- Exam under anesthesia
- Possible diagnostic laparoscopy or exploratory laparotomy
- Gelfoam, Surgicel
- Electro or chemical cautery
- Suturing
Vulvar hematoma

- Ice packs
- Bed rest
- Foley catheter
- Evacuation

Time required for nonhymenal genital injuries to heal

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>Time of resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrasions</td>
<td>2-3 days</td>
</tr>
<tr>
<td>Edema</td>
<td>5 days</td>
</tr>
<tr>
<td>Ecchymoses</td>
<td>2-18 days</td>
</tr>
<tr>
<td>Labial hematoma</td>
<td>2-4 weeks</td>
</tr>
<tr>
<td>Petechia</td>
<td>24 hours</td>
</tr>
<tr>
<td>Blood blisters</td>
<td>30 days</td>
</tr>
<tr>
<td>Superficial laceration</td>
<td>2 days</td>
</tr>
<tr>
<td>Deep lacerations</td>
<td>Surgical repair</td>
</tr>
</tbody>
</table>


Physical findings suggestive of sexual abuse

<table>
<thead>
<tr>
<th>Normal variants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periurethral bands</td>
</tr>
<tr>
<td>Perineal ridges</td>
</tr>
<tr>
<td>Hymenal bumps/tags</td>
</tr>
<tr>
<td>Anterior hymenal notching</td>
</tr>
<tr>
<td>Septate hymen</td>
</tr>
<tr>
<td>Urethral dilation with labial traction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-specific findings</th>
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</thead>
<tbody>
<tr>
<td>Erythema of the vestibule</td>
</tr>
<tr>
<td>Increased vascularity of vestibule</td>
</tr>
<tr>
<td>Labial adhesions</td>
</tr>
<tr>
<td>Friability of posterior fourchette</td>
</tr>
<tr>
<td>Excoriations</td>
</tr>
<tr>
<td>Petechia</td>
</tr>
<tr>
<td>Anal fissures</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Highly suspicious findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep posterior hymenal notching</td>
</tr>
<tr>
<td>Anti-genital warts</td>
</tr>
<tr>
<td>Vesicle lesions or ulcers</td>
</tr>
<tr>
<td>2cm anal dilation</td>
</tr>
<tr>
<td>Acute laceration or ecchymosis</td>
</tr>
<tr>
<td>Absence of posterior hymenal tissue</td>
</tr>
<tr>
<td>Culture confirmed STI</td>
</tr>
<tr>
<td>Pregnancy</td>
</tr>
<tr>
<td>Sperm</td>
</tr>
</tbody>
</table>
American Academy of Pediatrics  
Committee on Child Abuse and Neglect  
Guidelines for the evaluation of sexual abuse of children

<table>
<thead>
<tr>
<th>History</th>
<th>Exam</th>
<th>Labs</th>
<th>Level of concern</th>
<th>Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Normal</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Behavior</td>
<td>Normal</td>
<td>None</td>
<td>Variable</td>
<td>Possibly</td>
</tr>
<tr>
<td>None</td>
<td>Non-specific</td>
<td>None</td>
<td>Low</td>
<td>Possibly</td>
</tr>
<tr>
<td>Non-specific</td>
<td>Non-specific</td>
<td>None</td>
<td>Intermediate</td>
<td>Possibly</td>
</tr>
<tr>
<td>Clear</td>
<td>Normal</td>
<td>None</td>
<td>High</td>
<td>Report</td>
</tr>
<tr>
<td>None</td>
<td>Specific</td>
<td>None</td>
<td>High</td>
<td>Report</td>
</tr>
<tr>
<td>None</td>
<td>Non-specific</td>
<td>Positive</td>
<td>High</td>
<td>Report</td>
</tr>
</tbody>
</table>


Childhood Sexual Abuse

“The employment, use, persuasion, inducement, enticement, or coercion of any child to engage in, or assist any other person to engage in, any sexually explicit conduct or simulation of such conduct for the purpose of producing a visual depiction of such conduct; or the rape, and in cases of caretaker or inter-familial relationships, statutory rape, molestation, prostitution, or other forms of sexual exploitation of children, or incest with children.”

Sexual abuse and Sexual Assault

- Estimated 66,690 children are victims of sexual abuse annually
- Half present to the ED for initial evaluation
- Only 32% of adolescent females were offered all tests and prophylaxes recommended by the AAP after sexual assault (Merchant et al., 2008)
- Child advocacy center patients were more likely to receive a complete physical examination, referral for counseling, proper testing and prophylaxis (Edinburg, 2008; Walsh 2007)

Screening Tool for alleged pediatric sexual assault

1. Did the incident occur in the past 72h and was there oral contact or genital-genital or genital-oral contact
2. was genital or rectal pain, bleeding, discharge or injury present
3. was there concern for the child's safety
4. was an unrelated emergency medical condition present

Forensic Evidence Collection

- Clothing and debris collected
- Head and pubic hair combings
- Describe hematomas, ecchymoses, lacerations
- Scrape or swab dried secretions
- Bluemaxx lamp detection of semen
- Fingernail scrapings
- Wet prep and urine for sperm, trichomonads
- Serology for syphilis, HIV, hepatitis B
- Vaginal, rectal and throat cultures
- Urine or blood toxicology

Prophylactic treatment for alleged acute sexual assault

<table>
<thead>
<tr>
<th>Condition</th>
<th>Recommended Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonorrhea</td>
<td>Ceftriaxone 125mg IM</td>
</tr>
<tr>
<td>Trichomonas</td>
<td>Metronidazole 2g oral</td>
</tr>
<tr>
<td>Chlamydia</td>
<td>Azithromycin 1 g oral</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>Immunize</td>
</tr>
<tr>
<td>Pregnancy prevention</td>
<td>Levonorgestrel 0.75mg oral 12 hours apart X 2</td>
</tr>
<tr>
<td>HPV</td>
<td>Consider vaccine</td>
</tr>
<tr>
<td>HIV</td>
<td>Consider 2 nucleoside reverse transcriptase inhibitors and one non nucleoside reverse transcriptase inhibitor or protease inhibitor for 4 wk</td>
</tr>
</tbody>
</table>

Kaufman, M. Care of the adolescent sexual assault victim. Pediatrics 2008

Genital Burns

- Accidental scalding with hot liquids-irregular borders and non uniform burn depth
- Abuse-clear lines of demarcation
- Chemical

Foreign body
Vaginal Polyps

- Painless bleeding vulvar nodule
- Caused by repetitive valsalva maneuvering
- Treat with topical estrogen cream
- Do NOT biopsy!

Urethral Prolapse

- Painless bleeding vulvar nodule
- Caused by repetitive valsalva maneuvering
- Treat with topical estrogen cream
- Do NOT biopsy!
Pregnancy

• Spontaneous abortion
• Incomplete abortion
• Threatened abortion
• Ectopic pregnancy
• Subchorionic hematoma
• Implantation

Vaginal Bleeding

Non gynecologic

Dermatologic

Traumatic

Infectious

Structural

Estrogen withdrawal bleeding in the neonate

**Physiologic neonatal ovarian cysts**
- Functional neonatal ovarian cysts develop *in utero* in response to maternal hormones
- Clinically significant ovarian cyst occur in 1/2,500 live female births
- Rupture can result in estrogen withdrawal bleeding

**True precocious puberty**
- Activation of the HPO axis
- Secondary sexual characteristics
- Idiopathic
- Cerebral lesions

**Normal menstrual cycle**
- Estrogen causes proliferation and organization of the endometrium
- Progesterone stabilizes the endometrium
- Hormonal withdrawal causes lysosomal membrane destabilization and leakage
- Prostaglandins, proteases, and collagenases cause tissue breakdown and vasoconstriction of blood vessels
- Thrombin plugs spontaneously form
Dysfunctional uterine bleeding: The hormonal imbalance of adolescence

Estrogen breakthrough bleeding
- Estrogen causes proliferation of the endometrium
- Anovulation results in persistent estrogen and excessive growth of the endometrium
- Disorganized destabilization of the endometrial lining
- Dysfunctional bleeding

Diagnostic tools
- History and physical exam
- ßHCG
- CBC with platelets
- PT/PTT
- Liver and renal function tests
- TSH/Prolactin
- Pelvic ultrasound may not be indicated

Treatment for symptomatic dysfunctional bleeding
- Consider blood transfusion
- Short term estrogen therapy
  - High dose conjugated estrogen 25mg IV q4h X 24hours OR
  - Conjugated estrogen 1.25mg or 2.0mg po qd X 7days
  - OCP taper 4X4, 3X3, 2X2, 1X1
- Withdrawal
- Maintain on OCPs or progestins
Alternate treatments for menorrhagia

- Plasminogen activator inhibitors reduce menstrual blood flow by 40-50%
- Hemostatic agents that correct abnormal platelet function reduce capillary bleeding
- Levonorgestrel IUD
- Antifibrinolytics

Hemostatic disorders in Adolescents

19% of adolescents requiring hospitalization for abnormal uterine bleeding have a coagulopathy

<table>
<thead>
<tr>
<th>Disorder of hemostasis</th>
<th>% of patients (N=113)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platelet function disorder</td>
<td>18%</td>
</tr>
<tr>
<td>Von Willebrand disease</td>
<td>13%</td>
</tr>
<tr>
<td>Deficiency of coagulation factor (V,VII,IX,III,XII)</td>
<td>12%</td>
</tr>
<tr>
<td>Isolated increase bleeding time</td>
<td>7%</td>
</tr>
</tbody>
</table>


Screening for coagulation disorders

- History
- Physical exam
- CBC
- Platelet count
- Complete metabolic panel
- Fibrinogen level
- Platelet function
- PT/PTT
- Factor VIII level, vWF level, and ristocetin cofactor
- Blood type
Aphthous ulcers

Pelvic Inflammatory Disease
Early intervention=Prevention

PEACH Trial
831 patients randomized to inpatient or outpatient therapy
No difference in reproductive outcomes, PID recurrence, chronic pelvic pain or ectopic pregnancy

• Cefoxitin 2g q6hr 48hr plus doxycycline 100mg bid 14days inpatient
OR
• Cefoxitin 2gIM plus probenecid 1g plus doxycycline 100mg bid 14d outpatient

CDC Recommendations for outpatient treatment

• Ceftriaxone 250mg IM plus doxycycline 100mg bid 14d

  OR

• Cefoxitin 2g IM plus probenecid 1g oral plus doxycycline 100mg bid 14d


Indications for Hospitalization

• Pregnancy
• Failure of oral antibiotics
• Non compliance
• Severe clinical illness
• Tubo-ovarian abscess
• Severe allergy to penicillin
• HIV status is NOT considered

Polymicrobial Pelvic Infection: CDC Recommendations

• Cefoxitin 2g IV q6hr or cefotetan 2g IV q12hr
  Plus
• Doxycycline 100mg orally every 12 hrs
  OR
• Clindamycin 900mg q8hr
  Plus
• Gentamicin 2mg/kg then 1.5mg/kg q8hr
Non Gynecologic Pelvic Pain

- **Urologic**
  - UTI/urethritis, nephrolithiasis
- **GI**
  - constipation, IBS, IBD (Crohn’s, UC), bowel obstruction, appendicitis, gastroenteritis
- **Other**
  - musculoskeletal pain, mesenteric adenitis

Adnexal masses

- Hemorrhagic cyst
- Dermoid cyst
- Simple cyst
- Malignancy
- Paraovarian cyst
- Adnexal torsion
- Adnexal Torsion

Twisting of the ovary on its ligamentous supports results in impedance of blood supply
Factors predisposing to adnexal torsion in children

- Ovarian masses
- Elongated utero-ovarian ligament in prepubertal girls
- Persistent neonatal ovarian cyst
- Müllerian anomalies

Ovarian and fallopian tubal torsion

- 94% of cases associated with ovarian cyst or neoplasm, although normal ovaries may also tort
- May be associated with strenuous exercise or sudden increase in abdominal pressure
- Neonates present with abdominal mass, feeding intolerance, vomiting, abdominal distension and irritability

Incidence and Trends of Pediatric Ovarian Torsion Hospitalizations in the US, 2000-2006

- 2.7% of all cases of acute abdominal pain in children
- 58% of cases of ovarian torsion in children are associated with benign masses
- Less than 0.5% of ovarian torsion cases were associated with malignant neoplasm
- There were no cases of venous thromboembolism

Guthrie, B., Adler, M, Powell, E. Pediatrics. 2010;125;532-538
Adnexal Torsion

59% tubo-ovarian torsion
10% isolated tubal torsion
31% ovarian torsion
0% bilaterality

Symptoms associated with ovarian torsion

- Pain (91%)
- Tachycardia (46%)
- Nausea and vomiting (67-80%)
- Peritoneal signs (45%)
- Pain radiating to back, flank, or groin (51%)
- Fever (4%)
- Leukocytosis (20%)

Key Clinical Predictors in Early Diagnosis of Adnexal Torsion in Children

- Retrospective analysis of 94 patients who present to the ED at CCMC with acute abdominal pain
  - Intermittent pain associated with increased adnexal size were significantly related to adnexal torsion

The role of ultrasound in ovarian torsion

- Peripheral follicles with stromal edema
- Heterogenously enlarged ovaries
- Enlarged ovary crossing the midline
- A ratio of torsed adnexal volume to the normal adnexal volume greater than 20 is predictive of a mass inside the ovary
- Color flow Doppler can be appreciated in a torsed ovary
- Color flow Doppler can be absent in normal ovaries

Loss of normal ovarian paranchyma

Whirl pool sign
Ovarian torsion

- Must have high clinical index of suspicion in patients with acute and/or intermittent, variable abdominal pain and nausea/vomiting

- Surgical emergency to preserve ovarian functioning

Surgical management of ovarian torsion

- Diagnostic and therapeutic laparoscopy
- Exploratory laparotomy
- Ovarian preservation
- Detorsion of ovary
- Cystectomy
- Detorsion with second procedure cystectomy
- Cyst aspiration
- Ovarian bivalving
- Oophoropexy
- Oophorectomy
What should you do with the purple, black, and ugly ovary?

DETORT THE OVARY!

Assessing ovarian viability

- Color flow Doppler is not a reliable measure of ovarian viability
- Leukocytosis, fever, and signs of peritonitis may indicate irreversible damage to the ovary
- Macroscopic appearance is not a good indicator of viability
**Detorsion of the Ovary**

<table>
<thead>
<tr>
<th>Study</th>
<th>% recovery of ovarian function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oelsner et al., (1993)</td>
<td>91% (85/92)</td>
</tr>
<tr>
<td>Mage et al., (1989)</td>
<td>94% (16/17)</td>
</tr>
<tr>
<td>Shalev et al., (1995)</td>
<td>94% (49/52)</td>
</tr>
<tr>
<td>Rody et al., (2002)</td>
<td>100% (111)</td>
</tr>
<tr>
<td>Azee et al., (2004)</td>
<td>100% (14/14)</td>
</tr>
<tr>
<td>Celik et al., (2005)</td>
<td>92% (13/14)</td>
</tr>
<tr>
<td>Rousseau et al.</td>
<td>100% (19/19)</td>
</tr>
<tr>
<td>Levy et al.</td>
<td>100% (3/3)</td>
</tr>
<tr>
<td>Pansky et al.</td>
<td>88% (7/8)</td>
</tr>
<tr>
<td>Cohen et al., (1996)</td>
<td>100% (7/7)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>93% (211/227)</strong></td>
</tr>
</tbody>
</table>

How long is too long to wait to detorse the ovary?

- The adnexa of rats were twisted for 36 hours or until they became bluish-black in appearance.
- All ovaries that were torsed under 24 hours showed no immediate or delayed evidence of necrosis on histologic evaluation.
- Ovaries torsed for 36 hours showed immediate and delayed adnexal necrosis.


Ovarian torsion key points

- Early intervention for ovarian torsion results in preservation of ovarian function, despite the gross appearance of the ovary.
- Ultrasonographic appearance of the ovary is a useful tool for managing ovarian torsion, but color flow Doppler is not reliable.
- Oophoropexy of the detorsed adnexa or the contralateral ovary may be appropriate.
Obstructed Müllerian Anomalies

Segmental vaginal agenesis

Transverse vaginal septum

Functional rudimentary uterine horn

Cervical agenesis

Imperforate hymen

OHVIRA

Cyclic abdominal pain and Pelvic Mass in Adolescents

Think Mullerian Anomaly
Obstruction to menstrual egress

- Pelvic pain
- Urinary retention or constipation
- Hematometria/hematocolpos
- Pyometria/pyosalpinx
- Endometriosis

Cyclic pelvic pain and amenorrhea

- Imperforate hymen
- Transverse vaginal septum
- Segmental vaginal agensis

Cyclic pelvic pain and normal menses

**OHVIRA**
- Uterine didelphys
- Obstructed hemivagina
- Ipsilateral renal agenesis

**Functional**
**Rudimentary horn**
- Unicornuate uterus
- Contralateral cervical and vaginal agenesis
What should you do?

**Do**
- Suppress menses
- Provide analgesia
- Decompress the bladder for urinary retention
- Refer to specialist for surgical intervention

**Don’t**
- Perforate the dilated structure
- Attempt drainage
- Operate before the anatomy is clearly defined

Imperforate hymen