Chapter 11
Vulvovaginitis and Vaginal Bleeding in Pediatric and Adolescent Patients

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Differential Diagnosis

Vaginal Bleeding or Bloody Vaginal Discharge

Trauma
Foreign body
Shigella species
Yersinia species
Neonatal withdrawal bleeding
Menses:
- Menarche
- Precocious puberty
- Hypothyroidism

Hemangioma
Malignancy

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Infectious Vulvovaginitis

Streptococcus pyogenes (Group A streptococcus)
Haemophilus influenzae
Streptococcus pneumoniae
Staphylococcus aureus
Shigella species
Yersinia species
Neisseria gonorrhoeae
Chlamydia trachomatis
Trichomonas vaginalis
Herpes simplex virus (HSV)
Herpes zoster
Syphilis
Chancroid
Granuloma inguinale, also called donovanosis
Lymphogranuloma venereum (LGV)
Molluscum contagiosum
Condyloma acuminata
Pinworm
Scabies
Candida species
Tinea cruris
Post viral or idiopathic genital ulcers
Human immunodeficiency virus (HIV)
Tuberculosis

Noninfectious Vulvovaginitis

Inflammatory and/or immune-mediated:
- Allergic or irritant contact dermatitis
- Atopic dermatitis
- Foreign body

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Inflammatory and/or immune-mediated continued:
- Lichen sclerosis
- Behçet syndrome
- Inflammatory bowel disease
- Pyoderma gangrenosum
- Stevens-Johnson syndrome (SJS)
- Toxic epidermal necrolysis (TEN)
- Erythema multiforme
- Bullous pemphigoid
- Mucous membrane pemphigoid
- Pemphigus vulgaris
- Linear immunoglobulin A (IgA) dermatosis
- Paraneoplastic pemphigus
- Hidradenitis suppurativa
- Psoriasis
- Periodic fever, aphthous stomatitis, pharyngitis, and cervical adenitis (PFAPA)

Hormonal
- Labial adhesions

Urologic
- Urethral prolapse
- Ectopic ureter

Other
- Zinc deficiency
- Hemangioma
- Hematologic malignancy
- Vaginal malignancy
- Langerhans cell histiocytosis

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Vesicles/Ulcers

Herpes simplex virus
Herpes zoster, caused by varicella-zoster virus
Molluscum contagiosum
Post viral or idiopathic genital ulcers
Allergic or irritant contact dermatitis
Ulcerated hemangioma
Impetigo
Syphilis
Chancroid
Granuloma inguinale, also called donovanosis
Lymphogranuloma venereum (LGV)
Periodic fever, aphthous stomatitis, pharyngitis, and cervical adenitis (PFAPA)
Behçet syndrome
Langerhans cell histiocytosis
Pyoderma gangrenosum
Stevens-Johnson syndrome (SJS)
Toxic epidermal necrolysis (TEN)
Erythema multiforme
Bullous pemphigoid
Mucous membrane pemphigoid
Pemphigus vulgaris
Linear IgA dermatosis
Paraneoplastic pemphigus
Hidradenitis suppurativa
Hematologic malignancy
Human immunodeficiency virus (HIV)
Tuberculosis

Please refer to Chap. 7, Vulvovaginal Dermatoses, Lesions and Masses

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Vulvovaginal masses

- Acrochordons (skin tags)
- Vaginal polyp
- Redundant hymeneal tissue (often mistaken for polyp)
- Epidermoid inclusion cyst (sebaceous cyst)
- Urethral prolapse
- Hemangioma
- Condyloma acuminata
- Bartholin's gland cyst/abscess
- Uncommon cases: Vaginal malignancy, lipomas, neurofibromas

Please refer to Chap. 7, Vulvovaginal Dermatoses, Lesions and Masses for full list

When You Get the Call Ask for a full set of vital signs. Ensure the patient is in a private room to allow for an exam.

When You Arrive Review the patient's vital signs, making note of signs of symptomatic anemia (tachycardia, hypotension) in a patient with bleeding or evidence of infection (fever, tachycardia); of note, pediatric vital sign ranges differ from adult ranges. Determine who is accompanying the patient (parent, legal guardian) for purposes of consent and reviewing the patient's history.

History

The patient history should be tailored to the chief complaint. Obtain a complete history of the present illness including onset, duration, and severity of bleeding, associated symptoms of vulvovaginitis including discharge or itching, and any vulvovaginal trauma. A review of systems can include dysuria, pain with defecation and fevers.

Obtain a full medical history including any recent infections in the patient or family members—including respiratory and gastrointestinal infections, scabies, pinworm—known hematologic or autoimmune disorders, or a history of epistaxis, bleeding gums or petechiae. If the complaint is vaginal discharge or bleeding, ask whether she has had prior presentations for retained foreign bodies. When caring for an adolescent patient, review whether she has reached menarche and whether menses are regular. Inquire whether she is sexually active and using contraception.

Review recent antibiotic use, exogenous estrogen exposure (either through oral contraceptive use in adolescents, inappropriate access to hormonal medications in children, or use of herbal medications), or use of any new soaps, detergents, lotions, or other possible contact irritants. Consider, based on the patient's prior presentations, medical history, social history, and current presentation—and an account of her current presentation in her own words—whether the patient is vulnerable to sexual or physical abuse. Symptoms such as headaches, abdominal pain, or nightmares may indicate abuse [1].

Physical Examination

Note secondary sexual characteristics, including breast development and pubic and axillary hair development. As indicated, check for oral ulcers and plaques, scales, or bullae on extensor or flexor surfaces. Check for abscesses or scars in the axilla (suggestive of hidradenitis suppurativa). Assess for any other skin findings including café-au-lait spots and hemangiomas. Make note of bruises and abrasions elsewhere on the patient's body, which may lend insight into the mechanism of injury or may indicate physical or sexual abuse.

Perform an abdominal exam, specifically looking for pelvic masses. A pelvic mass may be most easily palpated by rectal exam. In order to perform vulvar exams in children, the knee-chest (Fig. 11.1) or frog-leg position (Fig. 11.2) is recom-

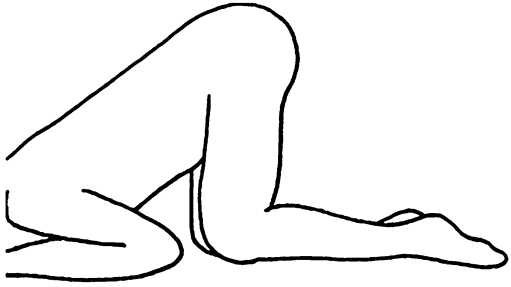

Fig. 11.1 Knee-chest position for pediatric gynecologic examination

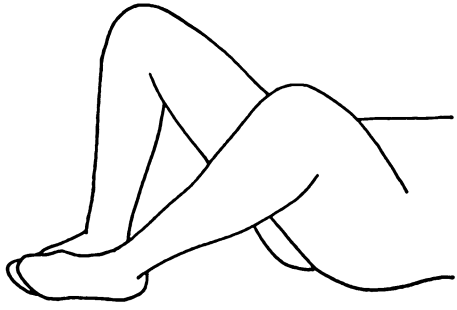

Fig. 11.2 Frog-leg position for pediatric gynecologic examination

mended. An anxious child can be accompanied onto the exam table by a parent, and the patient can be positioned in the frog-leg position while sitting between the parent's legs in the same position. During the examination, ensuring the patient's comfort and sense of control is a priority.

Depending on the patient's age, anxiety, and level of discomfort, conscious sedation may be required with the aid of anesthesiologists or emergency physicians. Exam under general anesthesia is indicated for vaginal hemorrhage, rapidly expanding vulvar hematoma, complex injuries, any injury not adequately visualized at the bedside, or if the patient is unable to tolerate the exam [2]. With or without sedation, in patients with perineal trauma or possible foreign bodies in the vagina, the perineum should be

irrigated with warm saline to optimize visualization. Topical application of 2 % lidocaine jelly to the vulva may improve patient comfort and visualization [1].

In patients with perineal trauma, if the traumatic injury is clearly external, internal exams are not commonly required in female children and adolescents. Assess for vaginal bleeding occurring separately from any visible perineal injury, which may indicate injury in the proximal vagina, likely necessitating anesthesia (conscious sedation or general anesthesia) to allow for complete examination and possible vaginoscopy using a hysteroscope or cystoscope [2]. In patients with blunt perineal injuries due to mechanisms other than straddle injuries, or penetrating injuries, cystoscopy and proctoscopy may also be required [3]. Observe for a vulvar hematoma.

Rarely, patients may be noted to have perineal burns, which warrant consultation by a burn specialist [4]. Of note, uniform and well-demarcated burns are concerning for inflicted injuries (i.e., abuse); purposeful chemical burns can involve batteries or other chemicals such as trichloroacetic acid. Accidental burns tend to be irregular and more superficial.

In patients complaining of discharge or itching, make note of erythema and/or excoriations, which may indicate the presence of contact irritant or infectious vulvovaginitis, and labial adhesions that may be obstructing urine outflow, leading to vaginitis. Note signs of *Candida*—thick white vaginal discharge or white or erythematous plaques.

Enterobius vermicularis (pinworm) may be suspected if the patient has itching, particularly at night, and perianal excoriations. Pinworm eggs may be detected by the "scotch tape test," by applying scotch tape to the perianal skin then briefly to a slide.

The physical exam may reveal stigmata of lichen sclerosis, including white, atrophic skin over the vulva and loss of vulvar architecture (labia minora), associated with itching [5]. Assess for vulvovaginal skin lesions, including condyloma, café-au-lait spots, or hemangiomas. Vaginal masses or tumors may also be found, including urethral polyps, vulvovaginal

polyps, or very rare vaginal malignancies. Upon retraction of the labia minora, the urethral prolapse will appear as a red ring of tissue protruding from the urethral orifice.

Diagnosis

The physical exam of a child with vaginal bleeding or vulvovaginitis will often suggest the diagnosis.

For **vulvovaginitis or vaginal discharge**, consider obtaining bacterial and/or fungal cultures. A swab of vaginal discharge can also be collected for a wet prep (microscopic examination of vaginal discharge prepared with normal saline and potassium hydroxide, separately) for detection of *T. vaginalis*, bacterial vaginosis, *Candida,* or dermatophytes, which cause tinea cruris. As indicated by the patient's presentation, consider sending nucleic acid amplification testing (NAAT) for *N. gonorrhoeae*, *C. trachomatis* and *T. vaginalis* from a vaginal swab (preferred) or urine sample (see "Bacterial and Protozoan Infections" below).

Of note, the diagnosis of chlamydia, gonorrhea, trichomoniasis, syphilis and HIV in children beyond the neonatal period is highly concerning for sexual abuse. Anogenital warts and genital HSV may also (though not always) be associated with abuse. Patients diagnosed with one sexually transmitted infection should be fully screened for others, and assessed for abuse with a multidisciplinary team.

If a foreign body in the vagina is suspected, pelvic radiograph or transabdominal or transperineal ultrasound may be helpful in establishing the diagnosis. If imaging and physical exam are nondiagnostic or poorly tolerated by the patient, exam under anesthesia may be required.

For **ulcerations**, viral culture and polymerase chain reaction (PCR) performed on swabs of the ulcer base are preferred for the diagnosis of HSV in patients with active lesions. Serum testing for syphilis and Epstein-Barr virus may also be helpful.

Identifying the etiology of **vaginal bleeding** is largely dependent on the physical exam; vulvar or vaginal lesions, polyps, lacerations or masses, or the presence of a foreign body should be visible at that time. If suspicion, based on the

history or initial physical exam, is for pelvic trauma, vaginal masses, or retained foreign bodies, the patient may require an exam under anesthesia and vaginoscopy.

In patients with complaints of abnormal vaginal bleeding who are postmenarchal, check a pregnancy test. Please see Chapter 2, Vaginal Hemorrhage, for more information on the assessment of abnormal vaginal bleeding in reproductive age women.

Management

Management of each condition is detailed below. Any patients with vulvovaginitis should be counseled regarding vulvar hygiene, namely, wiping after voiding or defecating from the vagina in the direction of the anus, avoiding possible contact irritants such as bubble baths or scented soaps, avoiding excessively washing or scrubbing the vagina or vulva, wearing loose-fitting clothes, and sleeping without underwear [6, 7].

Perineal Trauma

If the perineal trauma is a mild abrasion with slow oozing, consider applying ice packs. If this is insufficient, consider hemostatic agents such as gelatin foams [1]. If the perineal laceration is not hemostatic or appears deep, suturing may be required. Depending on the patient's age, anxiety, and pain, conscious sedation may be required before suturing; general anesthesia may be required for extensive or intravaginal lacerations. Local anesthesia should be administered, followed by interrupted sutures using a small diameter Chromic or Vicryl suture [1]. A Foley catheter should be placed prior to repairing a periurethral laceration.

Vulvar hematomas may form, associated with edema, fluctuance and/or ecchymosis. If a **vulvar hematoma** is forming, apply ice packs (Fig. 11.3). Consider placing a Foley catheter in the bladder if the hematoma is distorting perineal anatomy, potentially leading to urinary retention. Surgical intervention

Fig. 11.3 Right labial hematoma (Reprinted from Mok-Lin and Laufer [8], with permission from Elsevier)

is generally avoided for vulvar hematomas as most are self-limited; drainage may also introduce infection. Large or expanding hematomas should be incised to limit expansion and prevent skin necrosis; clot should be evacuated and any visible sources of bleeding should be controlled. Translabial ultrasound can be useful in differentiating edema (which should not be incised) from a hematoma if drainage is being considered. Insertion of a Word catheter has been described to prevent vulvar hematoma reaccumulation [8]. During the resolution of a vulvar hematoma, ecchymosis may be visible for weeks [9]. Patients should observe restricted activity during healing, for comfort and to avoid further trauma.

Burns beyond the most limited, shallow burns should be managed in conjunction with a burn specialist. Chemical burns should be extensively irrigated to prevent further injury. Any burns to the vaginal epithelium should be treated with estrogen to prevent scarring. Silver sulfadiazine 1 % may be applied to vulvar burns during the healing process, followed by an occlusive dressing [4].

Noninfectious Vulvovaginitis

Foreign Body

Among girls presenting with vulvovaginal complaints, 4 % have foreign bodies in the vagina, including toilet paper, tissue paper or paper towel, cloth, parts of toys, crayons, coins, and batteries [10]. Intravaginal batteries may result in alkaline burns [11]. Dermatitis may result from inflammation related to the foreign body (Fig. 11.4). Compared to girls with infectious or nonspecific vaginitis, those with foreign bodies are more likely to present with vaginal bleeding than vaginal discharge. Malodorous discharge is not routinely present with an intravaginal foreign body.

In order to extract a foreign body from the vagina, consider numbing the perineum with a topical analgesic, such as 2 % lidocaine jelly. The vagina should be irrigated with warm water to remove the foreign body. Consider conscious sedation

Fig. 11.4 Vaginal foreign body producing chronic irritation discharge (Reprinted from Fischer [15], with permission from John Wiley & Sons, Inc)

depending on the patient's age, anxiety, and pain and for objects that cannot be removed with simple irrigation.

The possibility of sexual abuse should be considered, particularly if the patient cannot provide a history of the object.

Nonspecific Vulvovaginitis

Vulvovaginitis is the most common cause of vaginal bleeding in prepubertal girls. Most vulvovaginitis is noninfectious, often due to hygiene issues. The absence of labial fat pads and pubic hair exposes thin, hypoestrogenized vulvovaginal skin to irritants and trauma. Other causes of vulvovaginitis, including sexually transmitted infections, must be excluded before initiating the treatments below.

Patients and their caregivers should be counseled regarding vulvar hygiene. Sitz baths—sitting in warm water for 5–10 min, two to three times per day—followed by gently patting the vulva dry are usually helpful as well.

Patients with persistent vaginal discharge following lifestyle changes and a negative assessment may be treated with a limited course of antibiotics such as amoxicillin or a cephalosporin [1]. If a patient has recurrent infections, a two-week course of vaginal estrogen cream, such as Premarin® (Wyeth Pharmaceuticals, Philadelphia, PA) or Estrace® (Actavis, Parsippany, NJ), may be initiated to reduce susceptibility to infection.

Conversely, persistent vaginal pruritus or irritation that does not resolve following lifestyle changes and sitz baths may be managed with a two-week course of daily or twice daily hydrocortisone 1 % cream. Lidocaine jelly or an antihistamine such as hydroxyzine (50 milligrams (mg) per day PO in children under 6 years and 50–100 mg/day PO in patients over 6 years, divided into 4 doses), or diphenhydramine (5 mg/kg per day PO divided into 4 doses, maximum 300 mg/day), may also be helpful [23]. The antihistamines may be sedating.

Please see "Allergic or irritant contact dermatitis" in Chap. 7, Vulvovaginal Dermatoses, Lesions and Masses.

Atopic Dermatitis

Atopic dermatitis, also called eczema, is often associated with a strong family history of eczema and a personal history of atopy, which describes a collection of conditions including asthma and seasonal allergies [6]. On physical exam, vulvar atopic dermatitis can appear similar to allergic or irritant contact dermatitis. The vulvar skin is erythematous, potentially lichenified (thickened), sometimes with a peripheral scale (Fig. 11.5).

Atopic dermatitis is managed with behavioral changes as detailed under "Management." Sitz baths may be helpful. Patients can also be treated with a short course of hydrocortisone 1 % cream or ointment twice per day for up to 2 weeks, in addition to emollients such as plain petrolatum.

Lichen Sclerosis

Lichen sclerosis is a chronic inflammation of the perineal and perianal skin; approximately 7–15 % of all cases occur in prepubertal females [12]. Patients report pruritis, pain, dysuria, and/or bleeding. On exam, the vulvar skin is thin, white, and/or atrophic with ulcerations; over time, vulvar architecture will be lost, with scarring of the labia minora, posterior

FIG. 11.5 Atopic vulvitis (Reprinted from Simpson and Murphy [6], with permission from Elsevier)

Fig. 11.6 Lichen sclerosis (Reprinted from Bercaw-Pratt et al. [5], with permission from Elsevier and the North American Society for Pediatric and Adolescent Gynecology)

fourchette, and clitoral hood (Fig. 11.6) [1]. The associated risk of malignancy, chiefly squamous cell carcinoma, in postmenopausal women is not observed in children.

In pediatric patients, treatment can usually be initiated without biopsy, as the risk of underlying malignancy is lower than in adults. Biopsy may be indicated for persistent disease despite corticosteroid treatment [5].

In pediatric patients, treatment of lichen sclerosis usually requires high-potency steroid ointment or cream, including clobetasol propionate 0.05 % daily or twice per day for 2 weeks, which is then tapered in frequency or potency if adequate response is noted [5]. The high potency steroid can be spaced to daily, then to every other day, then replaced with a taper of hydrocortisone 2.5 %, followed by the 1 % preparation [1]. Topical steroids may need to be restarted for flares. Other options include mometasone, or immunomodulators such as calcineurin inhibitors [13, 14].

For symptoms of itching, patients may take sedating antihistamines, including hydroxyzine (50 mg/day in children under 6 years and 50–100 mg/day in patients over 6 years, divided into 4 doses) or diphenhydramine (5 mg/kg/day PO divided into 4 doses, maximum 300 mg/day, and consider lower doses in children under 12 years). Further irritation can be managed with topical emollients such as plain petrolatum jelly or A + D® ointment (Bayer, Leverkusen, Germany) [5].

Zinc Deficiency

Zinc deficiency may result from inadequate dietary intake, chronic malabsorptive disease, or acrodermatitis enteropathica (a rare congenital defect of zinc absorption) [15]. Zinc deficiency may present as well-demarcated erosions on the vulva (Fig. 11.7). It usually presents at birth or at weaning in infants with acrodermatitis enteropathica, or after 6–9 months of exclusive breastfeeding, from mothers with low zinc content in their breast milk [15]. Treatment is zinc supplementation.

Fig. 11.7 Zinc deficiency (Reprinted from Fischer [15], with permission from John Wiley & Sons, Inc)

Psoriasis

Psoriasis is an inflammatory disease with a strong genetic predisposition; the most common form is chronic plaque psoriasis, in which patients have red or silver scaly plaques on extensor surfaces of the extremities, scalp, and genital regions, sometimes with nail changes, ocular complaints, or arthritis. Vulvar presentations are more common in children and may be misdiagnosed as eczema or fungal infections initially [15, 16]. Vulvar lesions are pruritic, erythematous, and well demarcated, though not often scaly like other psoriatic skin plaques (Fig. 11.8). The vagina is spared, though the inguinal regions and gluteal clefts may be involved; satellite lesions may also be present [6].

Treatment of psoriasis in children and adults is similar. Vulvar psoriasis is often first managed with topical corticosteroids, as other topical treatments (vitamin D analogues, tazarotene, calcineurin inhibitors) may cause irritation [17]. Mild-strength corticosteroids, such as 1 % hydrocortisone, or moderate-strength corticosteroids should be applied once or twice daily for a maximum of 2 weeks; high-potency steroids should be avoided as these regions are susceptible to steroid atrophy [6, 18]. Patients with severe, systemic dis-

Fig. 11.8 Vulvar psoriasis (Reprinted from Simpson and Murphy [6], with permission from Elsevier)

ease require management by a multidisciplinary team and may require treatment with systemic immunomodulators like infliximab [19].

Infectious Vulvovaginitis or Ulcers

Treatment for common pathogens is shown in Table 11.1.

Bacterial and Protozoan Infections

Respiratory, gastrointestinal, or sexually transmitted infections may lead to pediatric vulvovaginitis. **Streptococcus pyogenes** (Group A streptococcus) is the most common respiratory pathogen leading to vaginitis; it is isolated in up to 20 % of girls with vulvovaginitis [1]. A history of recent streptococcal pharyngitis may raise suspicion for streptococcal vaginitis. Vulvovaginitis resulting from *S. pyogenes* is characterized by vaginal discharge and perineal skin erythema and edema [22]. Treatment of *S. pyogenes* in children consists of amoxicillin (40 mg/kg PO divided into 3 doses daily for 10 days) [23]. Less commonly occurring respiratory pathogens implicated in vaginitis include *Haemophilus influenzae*, *Streptococcus pneumoniae*, and *Staphylococcus aureus* [23].

Shigella most commonly causes diarrhea illness but has also been associated with mucopurulent sanguineous vaginal discharge in girls. Diarrheal illness may only be reported in one-quarter of patients with *Shigella*-related vaginitis, most cases of which are caused by *S. flexneri* [24, 25]. Azithromycin is generally successful in treatment of *Shigella* infections in patients under 18 years of age; fluoroquinolones, commonly used in adults, are not administered to children given concerns for adverse musculoskeletal effects [26]. Though resistance has been reported, trimethoprim-sulfamethoxazole can also be used if a vaginal culture confirms susceptibility. The potential utility of cefixime has also been reported [24]. *Yersinia* is another enteric pathogen associated with vaginitis.

Table 11.1 Common pathogens

Pathogen	Treatment in adolescents, children over 45 kg	Children weighing less than 45 kg
Neisseria gonorrhoeae	Ceftriaxone: 250 mg IM once	Ceftriaxone: 25–50 mg/kg IV or IM once (up to 125 mg IM)
Chlamydia trachomatis	Azithromycin: 1 g PO once Alternative for children over 8 years: Doxycycline 100 mg PO every 12 h for 7 days	Erythromycin base or ethylsuccinate: 50 mg/kg/day PO in four divided doses, maximum 2 g/day, for 14 days
Trichomonas vaginalis	Metronidazole: 2 g PO in a single dose	Metronidazole: 15 mg/kg/day PO, maximum 2 g/day, in three divided doses for 7 days
Initial outbreak of genital HSV ulcers	(1) Acyclovir: 400 mg PO every 8 h for 7–10 days (2) Acyclovir: 200 mg PO five times per day for 7–10 days (3) Famciclovir: 250 mg PO every 8 h for 7–10 days (4) Valacyclovir: 1 g PO every 12 h for 7–10 days	Acyclovir: 80 mg/kg per day PO, maximum 1.2 g per day, divided into 3–4 doses *See text for management of neonatal HSV*

(continued)

Table 11.1 (continued)

Pinworm	(1) Albendazole: 400 mg (in children 20 kg or more) or 200 mg (in children < 20 kg) PO one time, repeated in 2 weeks
	(2) Pyrantel pamoate: 11 mg/kg PO, maximum 1 g, one time, repeated in 2 weeks
Tinea	Econazole, naftifine, oxiconazole, sulconazole 1 % preparations once per day, or clotrimazole, miconazole (not in children under 2 years) or tolnaftate 1 % preparations twice per day for 4–6 weeks
	Children over 12 years can also receive terbinafine 1 % cream twice per day or butenafine or ketoconazole 1 % cream once per day
Candida	Clotrimazole, econazole, miconazole (not for children under 2 years) 1 % preparations applied to the vulva twice per day for 10–14 days
	Adolescent patients with significant intravaginal involvement can use these over-the-counter formulations:
	(1) Miconazole 2 % cream 5 g intravaginally daily for 7 days
	(2) Miconazole, 100 mg vaginal suppository daily for 7 days
	(3) Miconazole, 200 mg vaginal suppository daily for 3 days
	(4) Clotrimazole 2 % cream, 5 g intravaginally daily for 3 days

From Committee on Infectious Diseases [20]; Centers for Disease Control and Prevention [21]

Sexually transmitted bacterial infections that may cause vulvovaginitis in pediatric and adolescent patients include **Neisseria gonorrhoeae** and **Chlamydia trachomatis. N. gonorrhoeae** infection in a prepubertal child is highly concerning for sexual abuse, and a multidisciplinary approach is needed; admission to the hospital should be considered, in order to coordinate resources [27]. Treatment is shown in Table 11.1. Co-treatment of chlamydia is recommended in all age groups. Chlamydia may be contracted either at birth or by sexual contact. If patients did acquire chlamydia at birth, however, persistence is thought to be unlikely past age 2–3 years given exposures to antibiotics for other reasons [1]. Sexual abuse should be considered in children who test positive for chlamydia; the index of suspicion is highest for children over 2 years [28]. Recommended treatment is shown in Table 11.1.

Trichomonas vaginalis, a flagellated protozoan, is also a sexually transmitted infection; it is rare in children whose poorly estrogenized vaginal epithelium is inherently less susceptible to trichomoniasis. Like chlamydia, it can be vertically transmitted from mother to infant at the time of vaginal birth, or by sexual contact [29]. As the effects of maternal estrogen wane and the vaginal pH of an infant changes, it has been theorized that a *T. vaginalis* infection may resolve. Treatment is indicated in a symptomatic child, and is shown in Table 11.1. When trichomoniasis occurs in postpubertal adolescents, it has most often been contracted through sexual contact.

For other sexually transmitted infections, namely, lymphogranuloma venereum (LGV), syphilis, chancroid, and granuloma inguinale, please see Chap. 7, Vulvovaginal Dermatoses, Lesions and Masses.

Herpes Simplex Virus

Herpes simplex virus (HSV) is a chronic viral infection that can be managed with antiviral medications. Two serotypes are most clinically relevant: HSV-1 classically causes oral lesions, while HSV-2 is associated with anogenital lesions. Increasingly,

HSV-1 is also associated with anogenital lesions and may be the cause of up to 50 % of herpes-related genital ulcers [20].

Neonates can be exposed to HSV during delivery. Symptoms manifest between birth and 6 weeks of life, in three iterations: (1) skin, eye, and mouth lesions, (2) central nervous system infection resulting in seizures and hypotonia, and (3) disseminated disease affecting several organ systems including the liver and lungs [20]. The incidence is estimated at 1 in 3,000–20,000 live births. Care of patients with suspected neonatal HSV requires consultation with pediatric infectious disease specialists. The recommended regimen for treatment of known or suspected neonatal herpes is acyclovir, at a dose of 60 mg/kg IV divided into 3 doses for 14 days for disease limited to the skin and mucous membranes, while treatment is continued for 21 days for disease that is disseminated or involving the central nervous system, followed by oral suppressive therapy for 6 months [21].

HSV presenting after the neonatal period is more likely to present with either oral or genital ulcers. Analysis of data from the National Health and Nutrition Examination Surveys (NHANES) from 1999 to 2002 reported a seroprevalence of HSV-1 of 31.9 % among girls aged 6–13 years [30]. From 2005 to 2010, the seroprevalence of HSV-1 among adolescents aged 14–19 years was 30.1 % [31]. From 2007 to 2010, the reported prevalence of HSV-2 among women aged 14–19 years was 1.5 % [32]. About 50 % of genital HSV diagnosed in children is related to sexual contact, more common over age 5 [33]. Other methods of transmission include nonsexual contact with children's genitalia by adults during child care or autoinoculation from an oral lesion.

Please see Chap. 7, Vulvovaginal Dermatoses, Lesions and Masses, for diagnostic modalities.

Treatment of an initial outbreak of HSV genital ulcers is discussed in Table 11.1. Parenteral therapy may be indicated in patients with immunosuppression, severe multisystem disease or encephalitis.

Chronic suppressive therapy is indicated in immunocompetent pediatric patients over 12 years of age experiencing six

or more recurrences per year. Acyclovir is recommended for chronic suppressive therapy (800 mg/day PO in two divided doses) for up to 12 months [20].

For **Zoster** please see "Vulvovaginal Dermatoses, Lesions and Masses"

Molluscum Contagiosum

Molluscum contagiosum is viral infection of the skin and mucous membranes causing painless flesh-colored umbilicated lesions, ranging from 1 mm to 1 cm in diameter, appearing on the vulva, thighs, and buttocks, which may become inflamed; lesions are rarely isolated to the vulva in children, as they may be in adults [15]. Molluscum is a common infection in children, though it may also occur in immunocompromised adults. Presentation with bleeding is not common, unless the patient has been scratching the lesions. Biopsy is not necessary for diagnosis, which is usually made based on clinical exam. Adults with molluscum contagiosum should be tested for other sexually transmitted infections and HIV; children presenting with molluscum are most often healthy [34].

As treatment can be uncomfortable, expectant management is acceptable in healthy pediatric patients with few lesions; spontaneous resolution is expected [15, 35]. Other options include, but are not limited to, application of topical anesthetic followed by curettage, which may result in scarring, application of liquid nitrogen, which is painful, and imiquimod 5 % cream applied overnight for three to five nights per week for up to 16 weeks, though imiquimod is not approved by the Food and Drug Administration for this purpose [15].

Condyloma Acuminata

Between 10 and 20 % of children will have warts, most commonly on the extremities, body, and face, with the peak incidence occurring between 12 and 16 years [36]. Spontaneous

resolution is common among all warts; for anogenital warts, spontaneous resolution occurs in up to 20 % of patients within 4 months and up to 75 % within 5 years [37].

Warts are caused by the human papillomavirus. Ninety percent of anogenital warts are caused by HPV strains 6 and 11 [38]. Anogenital warts are multiple, flesh-colored papules, which may form large exophytic masses. These may be asymptomatic or present with pain, itching, or bleeding [36].

A provider should consider sexual abuse in pediatric patients with anogenital warts; however, the mode of transmission of anogenital warts can also be nonsexual, such as on a caregiver's hands, or vertical, at the time of delivery [36]. If the patient's history or physical exam raises concern for sexual abuse, consider checking for sexually transmitted infections, including gonorrhea, chlamydia, HIV, hepatitis B and C, and syphilis [39].

Data regarding treatment of anogenital warts in children are limited, and treatment is often limited by children's pain tolerance. Expectant management initially is acceptable. For symptomatic patients, imiquimod 5 % cream, applied 3 nights per week for up to 16 weeks, or podophyllotoxin 0.5 % solution, applied 3 nights per week for up to 4 weeks, are acceptable [40]. For large or persistent lesions, surgical excision and laser therapy are options [36].

Pinworm

Enterobius vermicularis (pinworm) is most common in children in preschool or grade school and their families or caregivers. It should be suspected in patients with exposure to pinworm and/or who report perianal itching that is worse at night. Transmission is by the fecal-to-oral route, directly or via fomites [20]. Serology is not helpful; diagnosis is made by applying scotch tape to the perineum, then to a slide for identification of eggs. Treatment is indicated in a symptomatic child, and is shown in Table 11.1. The rate of reinfection is high.

For **scabies**, please see Chap. 7, Vulvovaginal Dermatoses, Lesions and Masses.

Candida

Candidiasis is a less common cause of vulvovaginitis in children, unless a patient has recent exposure to antibiotics or is immunosuppressed or diabetic [6]. Candidiasis may also occur in younger children wearing diapers. Newborn infants may have been inoculated during a vaginal delivery.

Candida vulvovaginitis may appear as well-demarcated erythematous plaques, sometimes accompanied by satellite lesions. Erythema, edema and excoriations may be visible. Diagnosis can be made clinically or using a vaginal fungal culture and/or microscopic examination of a vaginal swab or vulvar scraping prepared on a slide with 10 % potassium hydroxide, revealing buds and hyphae.

Treatment is primarily in the form of topical azoles, discussed in Table 11.1. Creams may address vulvar symptoms more completely than vaginal suppositories. For patients with an extensive *Candida* rash over the perineum and buttocks, antifungal creams can be used over these areas as well. Oral fluconazole is an option but interacts with several other medications including but not limited to phenytoin, tacrolimus, warfarin, cyclosporin A, and protease inhibitors.

Tinea

Tinea cruris is an uncommon cause of pediatric genital eruptions. Tinea infections produce erythematous and scaly plaques in the groin, sometimes extending onto the mons [15]. Lesions are extremely pruritic. Diagnosis is made by scraping the lesion onto a slide and preparing with a potassium hydroxide solution to visualize segmented hyphae and arthrospores. The lesions should also appear red when illuminated with a Wood's lamp [20].

Treatment is with topical antifungal creams. for 4–6 weeks, shown in Table 11.1. Oral griseofulvin can be used in refractory cases.

Post Viral or Idiopathic Genital Ulcers

Genital ulcerations have been diagnosed in the setting of systemic cytomegalovirus, influenza A, and Epstein-Barr virus (EBV) infections [41, 42]. EBV is most commonly associated with genital ulcerations; patients commonly report prodromal constitutional symptoms such as fever, sore throat, and myalgias. Cases in which no cause is discovered are called "Lipschutz" ulcers, also called ulcus vulvae acutum or reactive nonsexually related acute genital ulcers [43, 44]. The lesions vary in size and color, from white/gray to red or black and are often present on opposing labia, called "kissing ulcers" (Fig. 11.9) [41].

In general, biopsies are unhelpful. Serum testing for EBV infection may be highest yield. Influenza testing can be sent as deemed appropriate, and lesions can easily be swabbed for HSV.

Lidocaine jelly 2 % can be used for topical analgesia, and urine may need to be diverted with a Foley catheter in patients with very painful ulcers. The utility of topical steroids is unclear, though some recommend clobetasol 0.05 % cream or ointment twice per day for 7–10 days [45, 46]. Thirty per-

FIG. 11.9 Lipschutz ulcers. Pseudomembrane designated by *white arrow*; eschar designated by *black arrow* (Reprinted from Rosman et al. [44], with permission from John Wiley & Sons, Inc)

cent of vulvar lesions are superinfected; any evidence of purulence, erythema, or other signs of infection should be treated with broad-spectrum antibiotics, such as cephalosporins or sulfonamides [45].

Hormonal Causes of Vulvovaginal Complaints

Labial Adhesions

Labial adhesions are the fusion of the labia minora over the midline, attributed to the hypoestrogenic state of prepubertal girls. Usually, these will resolve spontaneously at puberty, when systemic estrogen rises [47]. When patients are symptomatic, usually this is because the flow of urine has been obstructed, resulting in an irritant dermatitis [48]. Topical estrogen cream, such as Premarin® (Wyeth Pharmaceuticals, Philadelphia, PA) or Estrace® (Actavis, Parsippany, NJ), administered twice daily for 10–14 days, is the primary therapy [49]. In most patients, topical estrogen treatment is sufficient to resolve adhesions. Second-line or adjunctive treatment with topical betamethasone 0.05% twice daily for 4-6 weeks may be required [48]. Long-standing or scarred labial adhesions may be more difficult to resolve; after failed or incomplete treatment with topical estrogen and steroids, persistent adhesions may rarely need to be separated after application of topical analgesics. Patients with significant adhesions may require sedation and separation in the operating room [47]. After separation, applications of topical estrogen cream should continue for two weeks; sitz baths and topical emollients such as plain petrolatum jelly or A + D® ointment are also helpful [1].

Neonatal Withdrawal Bleeding

In response to waning effects of maternal estrogen postnatally, neonates may have blood-tinged vaginal discharge or light vaginal bleeding in the first few weeks of life, which requires no further workup [50].

Precocious Puberty

Precocious puberty has commonly been defined as the onset of secondary sexual development before the age of 8 years in girls and 9 years in boys. More recently, this definition has been revised, and precocious puberty can be considered in the setting of development of breasts or pubic hair before age 7 years in Caucasian girls and age 6 years in African American girls [51]. The incidence of precocious puberty among children in the United States is estimated at 0.01–0.05 % per year; it is more common in girls and African Americans [52]. Causes of precocious puberty are either central, meaning the premature activation of the hypothalamic-pituitary-ovarian axis, or peripheral, due to excess hormone production, such as by estrogen-secreting ovarian cysts [23, 52].

Menarche generally occurs 2–3 years after the first sign of puberty, which is usually breast development and can be detected by physical examination [51]. Isolated premature menarche, defined as menarche in the absence of the secondary sexual characteristics, is very rare, and the cause is unknown. In a series of 17 patients with isolated premature menarche, most had a few menstrual cycles followed by amenorrhea until puberty, with no reported detrimental effects on final adult height or fertility [53].

The diagnosis of precocious puberty or isolated menarche does not constitute an emergency. These patients should be referred to pediatric or reproductive endocrinologists for further assessment and management, which is dictated by the underlying etiology.

Menarche

Patients may present with hemorrhage during their first menses, as certain hematologic disorders may be revealed at menarche, including thrombocytopenia and bleeding disor-

ders such as von Willebrand disease [54]. Please see Chap. 2, Vaginal Hemorrhage, for information on the diagnosis and management of vaginal hemorrhage and bleeding diathesis. Of note, adolescents' menses may also be irregular for the first 3 years post-menarche due to anovulation [55].

Hypothyroidism

Hypothyroidism can produce premature menstruation, in a syndrome of premature thelarche, growth delay, galactorrhea, and ovarian cysts—which can be massive—in varying combinations, called Van Wyk-Grumbach syndrome [56, 57]. Hypothyroidism can also cause menorrhagia [54]. Premature menstruation and thelarche will regress with thyroid replacement therapy.

Urologic Causes of Vulvovaginal Complaints

Urethral Prolapse

Urethral prolapse, which is the protrusion of the distal urethra, may be mistaken for a vaginal mass (Fig. 11.10). Urethral prolapse is most common in African American girls, presenting most often around 4 years of age [58]. Urethral prolapse is often nontender, though patients many complain of dysuria; hematuria is rare.

Urethral prolapse should be managed with sitz baths (sitting in warm water for 5–10 min) twice per day until symptoms improve and topical estrogen therapy, such as Premarin® cream (Wyeth Pharmaceuticals, Philadelphia, PA) or Estrace® cream (Actavis, Parsippany, NJ), applied daily with a fingertip or cotton-tipped applicator, for at least 2 weeks. In patients with suspected urethral prolapse, the differential diagnosis includes paraurethral cysts, prolapsed urethroceles, or urethral polyps [1].

Fig. 11.10 Urethral prolapse in a prepubertal female (Reprinted from Kondamudi et al. [57], with permission from Elsevier and the American Academy of Emergency Medicine)

Ectopic Ureter

An ectopic ureter draining into the gynecologic organs or directly onto the perineum may constitute a significant contact irritant. Ultrasonography or computed tomography and voiding urethrocystography can be used to diagnose an ectopic ureter; cysto-vaginoscopy may also be required [59]. Given case reports of vaginal clear cell cancers in patients whose ectopic ureter drained into the vagina, experts suggest vaginal exams in alternating years, with Pap smears at those exams in children, and annual Pap smears in adolescents [1].

Less Common Vulvovaginal Pathology

Several rare etiologies of vulvar ulcerations or masses are described in Chap. 7, Vulvovaginal Dermatoses, Lesions and Masses. These include hematologic malignancy, Behçet's syn-

drome, inflammatory bowel disease, pyoderma gangrenosum, Stevens-Johnson syndrome (SJS), toxic epidermal necrolysis (TEN), erythema multiforme, bullous pemphigoid, mucous membrane pemphigoid, pemphigus vulgaris, linear IgA dermatosis, paraneoplastic pemphigus, and hidradenitis suppurativa.

Hemangiomas

Hemangiomas are benign blood vessel proliferations occurring in 2 % of all newborns. Twenty percent of these children will have multiple hemangiomas [60]. Most hemangiomas will involute spontaneously, though skin changes may persist. In the genital region, hemangiomas are most often complicated by ulceration [61]. Occasionally, ulceration may precede the diagnosis of hemangioma, and biopsies may be nonspecific. An ulcerated hemangioma should be kept clean with bathing and dressed with a topical antibiotic, such as mupirocin 2 % ointment, or silver sulfadiazine cream. Lesions can be treated with pulsed dye laser, which leads to more rapid resolution [62].

Lobular capillary hemangiomas, also called pyogenic granulomas, have been reported in the vagina, though they are more often found on the oral mucosal membranes and the skin; these hemangiomas can bleed heavily and repeatedly [63, 64]. Cauterization with silver nitrate is first-line therapy; lesions that bleed recurrently may require excision.

Malignancy of the Lower Genital Tract

Vaginal and pelvic malignancies are very rare causes of vaginal bleeding in children but can present with bleeding due to friability of the mass or abnormal hormone production.

Endodermal sinus tumors and rhabdomyosarcomas are rare malignancies in children that can present with vaginal bleeding or bloody discharge. These are usually diagnosed by age 3 years [48, 65]. In children under 3 years with rhabdomyosarcoma of the genital tract, the mass is usually in the

lower vagina, while in children over 10 years, the mass is more likely to be situated in the upper vagina or cervix [66]. The tumor may appear protruding from the vagina as a grapelike, vascular mass. Early stage treatment can involve chemotherapy, conservative surgery, and radiation therapy for some, with an overall 5-year survival of 87 % [67]. Similar to rhabdomyosarcomas, endodermal sinus tumors present with bloody discharge or a mass protruding from the vagina. These tumors secrete alpha fetoprotein (AFP), which can be detected in the serum.

Langerhans Cell Histiocytosis

Langerhans cell histiocytosis is a rare syndrome of abnormal proliferation of immune cells, with peak incidence at 1 year of age [61]. This condition can involve multiple organ systems, including bone and the central nervous system. Patients commonly present with yellow-brown papules at the hairline, over the trunk, and in the axilla or groin. Vesicles, pustules, ulcerations or eczematous rashes can also be present [68]. Perianal petechiae and purpura may be identified. If Langerhans cell histiocytosis is suspected, lesions should be biopsied.

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