

Clinical presentation, diagnosis and treatment of vulvovaginitis in girls: a current approach and review of the literature

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Background: Vulvovaginitis is the most common cause of gynecological complaints in children and young girls. Some of the factors which cause vulvovaginitis include hypoestrogenism, the anatomical proximity of rectum and delicate vulvar skin and vaginal mucosa.

Data sources: We made a literature search with Pubmed, Medline and Cochrane database from January 2002 to May 2015 in English language using the key words vulvovaginitis, children, clinical, diagnosis and treatment.

Results: Vulvovaginitis in girls is usually caused by non-specific factors and hygiene measures, bioyoghurt and avoidance of chemical irritants are generally useful. Weight control if necessary and prevention of voiding dysfunction are effective. Vaginal flora is important in girls and results should be interpreted with clinical features to decide whether an isolated microorganism is part of the normal microflora or is the cause of symptomatic vulvovaginitis. Specific treatment is generally considered in case of a detected pathogen microorganism. Isolation of a sexually transmitted organism requires further investigation. Persistent disease may not always indicate a foreign body but it must be taken into account. Girls and parents are encouraged psychologically in all steps of evaluation, diagnosis and treatment. Probiotics, nanotechnology and petroleum jelly are other important treatment options used in vulvovaginitis.

Conclusions: In this review, we present current approach to the presentation and management of vulvovaginitis in childhood. This disorder requires a comprehensive evaluation in all steps of diagnosis, differential diagnosis and treatment.

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Key words: children;
diagnosis;
treatment;
vulvovaginitis

Introduction

Vulvovaginitis is the inflammation of the vulvovaginal mucous membranes. Vulvitis, vaginitis and vulvovaginitis are used to define the inflammatory processes of the lower genital tract of girls. It is the most common gynecological problem especially seen in prepubertal girls and causes anxiety in both the child and the parents. Appropriate diagnosis, treatment and education of the family is possible with pediatric gynecological examination which resolves the worries. Inadequate or excessive hygiene and chemical irritants are the most frequent causes of vulvovaginitis. Educating the girl and parents about hygiene measures is generally useful. In this review, we aimed to discuss current data about clinical presentation, diagnosis and treatment of vulvovaginitis in the pediatric population. We made a literature search with Pubmed, Medline and Cochrane database from January 2002 to May 2015 to select the articles about clinical presentation, diagnosis and treatment of vulvovaginitis in girls. We limited our search to literature in English language. We used the key words vulvovaginitis, children, clinical, diagnosis and treatment.

Related factors and etiopathogenesis

Vulvitis refers to external genital pruritus, burning, redness or rash. Vaginitis implies inflammation of the vagina, manifesting a discharge with or without odor or bleeding. Vaginitis can cause vulvitis. Hypoestrogenised

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state of the prepubertal girls increases the susceptibility of the vaginal mucosa to infection. The mucosa is thin, has an alkaline pH and lacks cornification, all leading to vulvovaginitis. Other factors that increase the risk are proximity of the rectum, flattened labia, lack of pubic hair and small labia minora. Labial adhesions may occur under similar conditions but they may be a consequence of recurrent vulvovaginitis. Poor hygiene, spread of respiratory bacteria from hand to perineum and local irritants are other risk factors.^[1-3]

Romero et al^[4] reported voiding dysfunction to be an important factor of persistent vulvovaginitis in 20 patients aged 4-14 years; among them, 19 (95%) had urodynamicia, 10 (52.6%) had an overactive bladder, 8 (42.1%) bladder sphincter dyssynergia, 1 (5.2%) hypotonic bladder; and 13 (65%) showed improvement with treatment. Patients with an overactive bladder were treated with oxybutynin acid. Those with voiding dysfunction and sphincter dyssynergia were also treated with biofeedback, consisting of pelvic floor training. All patients were evaluated after three months and vaginal discharge ceased.^[4]

In a case series of Curran et al,^[5] four adolescent girls aged 13-16 years were presented who sought medical attention for severe vulvovaginitis and were subsequently found to have type 2 diabetes. Despite only one of the cases had *Candida* species identified on culture, it is reported that complete resolution of symptoms was achieved in all four cases with antimycotic agents. Uncontrolled diabetes is associated with increased risk of symptomatic *Candida* vulvovaginitis but in this report it has been the presenting symptom of undiagnosed diabetes. These cases point that the presence of vulvovaginitis in adolescents with other risk factors of type 2 diabetes should prompt urgent testing for the presence of diabetes.^[5]

Other causes

Poor hygiene, chemical irritants such as bath soaps, shampoos, swimming pools, detergents, nylon underwear, tight clothing are other nonspecific causes. The presence of diarrhea, oxyuriasis and possibility of foreign objects in the vagina should also be asked. The possibility of sexual abuse should always be considered in a girl with genital symptoms, rectal or genital bleeding, developmentally unusual behavior, persistent symptoms and an organism associated with sexual transmission.^[6-8]

Microbiology

The microbial ecosystem in girls with clinical signs of vulvovaginitis is complex and variable, and the presence of a microorganism does not necessarily imply

that it is the cause of infection.^[9] Randelovic et al^[9] reported that similar microbial flora was isolated in 500 symptomatic girls and 30 asymptomatic girls aged 2-12 years, but the symptomatic group had significantly more positive microbiological findings. In symptomatic girls, *Streptococcus pyogenes* (4.2%), *Haemophilus influenza* (0.4%), *Staphylococcus aureus* (5.8%) were isolated.^[9] Girls with recurrent bacterial vulvovaginitis that responded to treatment of underlying constipation has been reported. No recurrence of vulvovaginitis occurred during the follow up period of 15 to 36 months.^[10]

Fecal flora was more common compared to controls and in girls up to 6 years; *Proteus mirabilis* (14.4%), *Enterococcus faecalis* (12.2%) and *Escherichia coli* (7%) implying the importance of front to back cleaning. *Candida* species were found only in 2.4% of symptomatic girls.^[9]

Ocampo et al observed that in a total of 229 patients Oxyuris (47.4%) and mixed flora (26.9%) were more common in the 0-8.9 years age group, while in the 9-15.9 years age group mixed flora (23.1%), other *Candida albicans* (17.9%), Ureaplasma (16.4%) and Oxyuris (11.9%) were the most frequent germs. In 16-18 age group, positive cases were recorded only for Oxyuris ($n=3$), *Chlamydia trachomatis* ($n=1$), *Gardnerella* ($n=2$), mixed flora ($n=1$), Trichomonas ($n=1$) and *Candida* ($n=1$).^[3]

Gorbachinsky et al noted that periurethral swabs from girls with vulvovaginitis were associated with a significant increase in uropathogenic bacteria (79% *Enterococcus species* or *Escherichia coli*) compared with girls without vaginitis (18%). Patients' inclusion criteria included at least one of the symptoms; frequency, urgency, dysuria, hesitancy or nocturia. Urine cultures were positive in 52% of girls with vulvovaginitis and only in 11% of girls without vulvovaginitis. The urine cultures matched the species of the corresponding periurethral swab. So vulvovaginitis is shown to cause urinary tract infection by altering the perineal biome because there is increased colonization of uropathogens.^[11]

In a study of Yilmaz A et al,^[12] 72 prepubertal and 40 pubertal patients were evaluated. 52.7% of the prepubertal group had a positive vaginal culture and group A beta-hemolytic streptococcus were the most encountered microorganism (15.2%). Culture positivity rate in the pubertal group was 47.5%, with *Candida albicans* being the most frequently isolated microorganism (27.5%).^[12]

Diagnosis and treatment

Clinical features of vulvovaginitis are vaginal discharge (62%-92%), redness (82%), soreness (74%), itching

(45%-58%), dysuria (19%) and bleeding (5%-10%).

A detailed history should include the duration of symptoms, characteristics of discharge, previous treatments, pubertal development, trauma, suspicion of a foreign body, atopy, hygiene habits and possibility of abuse. Interview should be together with the girl and parents.

It is important to perform systemic physical examination first and genital inspection afterwards. Pubertal evaluation and skin, mucosa lesions should be carefully checked. Perineal hygiene, vaginal discharge, hymenal anomalies, skin lesions, secondary excoriations, foreign body and trauma signs can be evident with genital inspection.

Differential diagnosis of vulvovaginitis involves urinary tract infection (UTI), lichen sclerosis, psoriasis, eczema, contact dermatitis, scabies, vesicovaginal reflux, ectopic ureter, congenital enteric fistula and systemic diseases (Kawasaki disease, Crohn's disease, scarlet fever).

If there are symptoms or signs of vulvovaginitis in a girl, microscopy, gram staining and culture of vaginal secretions are important in diagnosis. Presence of leucocytes in microscopy increases the possibility

of pathogen bacteria in the culture. Urine analysis and urine culture are necessary in girls who have dysuria. If there is a suspicion of threadworm infection stool microscopy and sellotape test are used for diagnosis.

The first stage of treatment in childhood vulvovaginitis is teaching genital hygiene. Front to back cleaning after toilet should be explained to mother and to the girl if her age is appropriate. If the girl closes her legs while urinating, this will worsen the existing infection. Mother or caregiver should tell the girl to open her legs during urination. Perineal region should be washed with non pressurised warm water for two minutes three-four times a day and wiped with towel until the vaginal culture result is obtained. Soap for washing and toilet paper or paper towel for wiping are not recommended. Overweight or obese girls should be encouraged to loose weight. In the presence of constipation, patients are suggested fiber rich diet, increased water intake and medication if necessary.^[13]

Topical or systemic antibiotics are generally useful if there is a confirmed pathogen microorganism (Table).^[14] In threadworm infection mebendazole is useful. Antifungal creams are usually effective in adolescent girls with candidal infections. Isolation of a sexually transmitted organism requires further investigation. Physicians should also be aware that the prevalence of vulvovaginitis is increased in sexually abused girls. In persistent disease the possibility of a foreign body should be checked.^[15-17]

In persistent nonspecific vulvovaginitis empirical amoxicilline/clavulonate or cephalosporin group antibiotics can be used for 14 days additionally.

Probiotics are also useful in girls with nonspecific vulvovaginitis. Probiotics are live microorganisms utilised if given in sufficient amounts to the host. They create an acidic environment, produces hydrogen peroxide and bakteriosin. They disrupt the structure of toxins and neutralise them. Probiotics also activate the immune system of the host. They decrease the

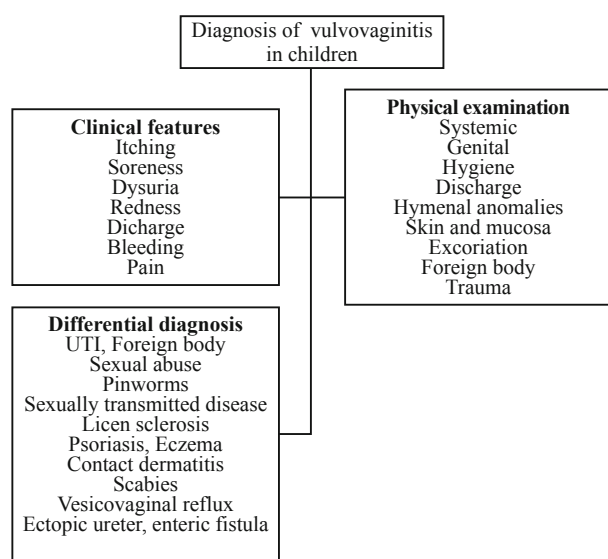


Fig. 1. Diagnosis of vulvovaginitis in children. UTI: urinary tract infection.

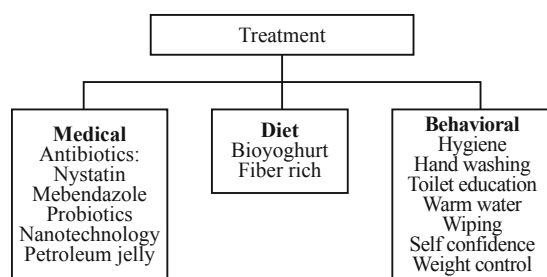


Fig. 2. Treatment approaches to vulvovaginitis in children.

Table. Antiinfectives for specific agents of vulvovaginitis

Antiinfectives for specific vulvovaginitis	Microorganisms that can be eradicated
Penicillin V (250 mg po, tid), 10 d	<i>Streptococcus pyogenes</i> <i>Streptococcus pneumonia</i>
Amoxicillin (clavulanate 20-40 mg/kg/d po), 10 d	<i>Staphylococcus aureus</i> <i>Streptococcus pyogenes</i> <i>Streptococcus pneumonia</i>
Trimethoprim-Sulfamethoxazole (8 mg/40 mg/kg/d po), 5 d	<i>Shigella</i>
Azithromycin (10 mg/kg/d), 3 d	<i>Chlamydia trachomatis</i>
Ceftriaxone, (125 mg im), single dose	<i>Neisseria gonorrhoeae</i>
Topical nystatin, miconazole	<i>Candida</i>
Mebendazole (100 mg chewable tablet), repeated in two wk	Pinworms (<i>Enterobius vermicularis</i>)

Tid: three times a day; po: by mouth.

proinflammatory cytokines like IL-6, IL-8 and TNF- α .

In addition, probiotics avoid the attachment of uropathogen bacteria to uroepithelium.^[18] Fecal flora is a significant cause of vulvovaginitis and urinary tract infections in girls, so the content of this flora has become important. In a study of Kavukcu et al, capsule or powder preparation containing five billion colony forming units of *Saccharomyces boulardii* (*S. Boulardii*) was administered orally to 24 children aged 3-16 years for five days. *Escherichia coli* colony number in the colon was measured before and after treatment. Decrease in the *E. coli* colonization in the children's stool was found with this method. Therefore, prevention from vulvovaginitis and urinary tract infections can be possible using *S. boulardii*.^[19]

Recently, it has been reported by several studies that this kind of infections can be prevented using nanotechnology. Application of nanoparticles on the surfaces prevent adhesion of bacteria and formation of biofilm. Biofilm is a sheet around bacteria protecting them from immune system and antibiotics. Silver is slowly released from the surface and kills the bacteria close to surface. Women who wear silver nanoparticles containing underwear, are enounced to have decreased vulvovaginitis attacks. The major problem is that the antimicrobial mechanism of silver and the extent of its effect is not exactly understood.^[20]

Catheter related high infection rate in urinary tract infections is shown to be caused by formation of biofilm layer on the catheter surface decreasing the antibiotic effect and resulting in antimicrobial resistance. He et al^[21] reported that application of a water soluble spray that contains nanocations molecularly, developed using nanotechnology, avoided biofilm structures produced by microorganisms on the catheters.^[21] Mannose placed nanotechnologically on the catheters, forms biofilms with *E. coli* 83972 which causes asymptomatic bacteriuria, so pathogens cannot form biofilms on the catheter. As a result of this protective biofilm layer formation, *Enterococcus faecalis* adhesion decreased as much as 83 times.^[22] Unfortunately, no evidence-based study indicated the decrease of vulvovaginitis rate in girls using nanotechnology for underwear. Kavukcu et al^[23] reported that using nanotechnologically produced underwear did not reduce the risk of contamination in urine samples collected with urine bag in girls.

After the risk factors such as bath soaps, tight clothing, nylon underwear are avoided, application of sterile petroleum jelly on the vulva once a day for six months, has shown to protect labial epithelium from irritants and avoid labial adhesions. In case of posterior sinechia, drying the area with towel and applying petroleum jelly are useful. Sinechia can be dilated with

small surgical intervention in few cases that do not resolve with topical treatment.^[13,24]

Vulvovaginitis and labial adhesions occur commonly in girls and can provoke high anxiety in both the parent and child. Performed correctly, the pediatric gynecologic examination can diagnose and treat, educate and reassure both the parent and the girl. This examination requires patience, sensitivity, direct communication with the girl as well as with the parent, and an open manner that inspires trust in both side to manage a potentially anxiety provoking situation. It should explained appropriately to the girl that examination is not painful. Examination should begin with antropometric measures, continue with systemic evaluation and end with genital inspection. One of the parents holding the girl's hand will help to lower anxiety. Self confidence improving approaches will ensure collaboration with the child and family.^[2,13]

Conclusions

The diagnosis of vulvovaginitis requires a complex and comprehensive approach, and microbiological findings should be interpreted together with clinical findings. Also the etiopathogenesis and culture results differ between prepubertal and adolescent girls with vulvovaginitis. Urinary tract infections, foreign body, sexual abuse should be investigated in recurrent vulvovaginitis. Hygiene habits of the girl and family should be checked. These are the key points that should be considered in the treatment approach of this disorder.

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