

Infections of the lower female genital tract during childhood and adolescence

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Summary

Purpose: To review the pathogenesis, clinical presentation, diagnosis and treatment of lower female genital tract infections at a young age.

Methods: Review study.

Conclusions: Lower female genital tract infections at a young age may involve the vulva, the vagina and, less frequently, the fallopian tubes. Good knowledge of the physiology and anatomy of the respective areas plays an important role in the diagnosis and treatment of vulvovaginitis. *Candida albicans* is the most frequent cause of infection, while *Gardnerella vaginalis*, *Chlamydia trachomatis*, *Mycoplasma*, and *Trichomonas vaginalis* are rarer ones. The clinical presentation includes a variety of symptoms and signs, with vaginal discharge being the prominent one. Treatment should be causative after careful investigation while preventive advice is mandatory.

Key words: Vulvovaginitis; Childhood; Puberty; Vaginal discharge.

Introduction

Infections of the lower female genital tract at a young age may involve the vulva, the vagina and, less frequently, the fallopian tubes. Their incidence and clinical presentation depends on the circulating levels of estrogens, the presence of menstruation, the frequency of sexual intercourse (if any), and the use of any contraceptive methods. During childhood, such an infection usually involves the whole vulval and vaginal area, and it is usually referred as vulvovaginitis. Knowledge of vaginal physiology and anatomy in young girls plays an important role for the diagnosis and treatment of vulvovaginitis.

In neonates, due to the effect of estrogens during pregnancy, the vaginal epithelium is mature, while the vulva is developed and its skin is thick and elastic. The pH of the vagina in neonates is 5.7 on the first day, 5.6 on the second, 4.9 on the third and 4.8 on the fourth day. Gradually, it becomes alkaline and in two to six weeks it is stabilized at 7.0 to 8.0, remaining alkaline until puberty. With the onset of menstruation, the pH decreases to very low levels, (3.5-4.5), varying thereafter according to the menstrual cycle phase [1-4]. Vaginal cultures from neonates are free of microorganisms during the first 12 hours of life. Twenty-four hours later, the presence of certain microorganisms is noted and 48 hours later the presence of lactobacilli *Doderlein* contributes to an acidic vaginal environment. In the first 48 hours, the pH of the vagina is attributed to enzyme glycogenase activity. Finally, a few days after childbirth, leukocytes are noted in the vaginal fluid, in varying counts [4-6].

Each important change regarding the physiology of the vagina predisposes to a related increase in vaginal discharge, which reflects the alterations of the vaginal flora. Fraenkel and Papanicolaou were the first to point out the changes in the exfoliated cells of the vagina in newborn females as well as during menopause. The investigators observed that after the first week of life, the exfoliated cells were compact, round or egg-like, and looked like those found during climacteric, when vaginal atrophy starts. Fifteen days later, undifferentiated or transient cells were found in the vaginal mucous and the parabasal layer was the prominent feature in half of the cases they examined [3, 6, 7].

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The presence and amount of glycogen in the vagina differs in the neonate, in puberty and in adolescence and is directly correlated to vaginal pH changes. Glycogen is found in vaginal cells and is released during apoptosis. Because apoptosis of vaginal cells is influenced by the fluctuations of estrogens, similar fluctuations are observed in the amount of vaginal glycogen. Specifically, the latter is significant at birth, maximum at ovulation and minimum during childhood, as well as after menopause [5, 8, 9].

Pathogens

A great variety of microorganisms are normally found in the vaginal flora, like *Staphylococcus epidermidis*, diphtheroids, lactobacilli and anaerobic bacteria, such as bacteroides.

Candida species represent the most frequent cause of female genital infections in all ages. Of them, *Candida albicans* is also isolated in the mouth and the colon of healthy individuals [10-13].

Gardnerella vaginalis is a frequent cause of vaginitis especially in women of low socio-economic class with intense sexual activity, with multiple sexual partners or other sexually transmitted diseases. *Gardnerella* rarely causes clinical symptoms of vulvovaginitis during childhood and adolescence, even though it has been isolated in vaginal samples of asymptomatic healthy children, from two months up to 15 years of age [7, 14-16].

Trichomoniasis is relatively rare in prepubertal age. Its incidence in young girls is estimated at approximately 3% of genital infections and it is positively correlated with the production of estrogens as well as with the presence of the same infection in the young girl's mother. *Trichomonas vaginalis* is usually isolated in the vagina, while *Trichomonas hominis* is in the intestine. *Trichomonas vaginalis* generally prefers a vagina exposed to the action of estrogens. It is usually transmitted by sexual intercourse and quite rarely by indirect contact (swimming pools, etc). Incubation time of the infection is four to 30 days.

Chlamydia trachomatis rarely causes vulvovaginitis in childhood, puberty or adolescence. Neonates are usually infected by their mothers during vaginal delivery. Many authors argue that *Chlamydia trachomatis* does not cause vaginitis in atrophic vaginal epithelium [17, 18].

Mycoplasma hominis is an infrequent cause of vaginitis in childhood and puberty, which is sometimes related to sexual abuse.

Hemophilus is normally present in the urinary system of women. Vaginitis by *hemophilus* is uncommon in childhood [12, 13, 16, 19, 20].

Another cause of vulvovaginitis in childhood, which is responsible for 2-5% of all cases, is the presence of foreign bodies, like paper or cotton material. It is usually accompanied by a malodorous and long standing vaginal discharge and/or bleeding which is non-responsive to antibiotics.

Finally in many cases, vaginitis during childhood is secondary to other inflammations, such as ear infections and bronchitis.

Symptoms - Signs

The clinical presentation of vulvovaginitis at a young age may include a variety of features, like vaginal discharge, leukorrhea (serous, mucoid, etc.), pruritus, dysuria, local sensitivity, pain, edema and punctuate hemorrhages of the vagina. Vulvovaginitis in childhood may result in labia minora adhesion. This complication is more frequent between the ages of two and six and differential diagnoses should include vaginal aplasia and hymen atresia.

Diagnostic approach

Investigation of vulvovaginitis in childhood should include medical history, clinical examination, laboratory tests, vaginoscopy and other special diagnostic methods. Laboratory tests are applied according to each individual case and include vaginal sampling for aerobic and anaerobic cultures and detection of *Candida*, *trichomonas*, *mycoplasma* or *chlamydia*, urinalysis, urine culture, culture of feces as well as cytological examination of the vagina. A sample from the vagina is taken by inserting through the hymen a sterilized

cotton swab of small diameter. The swab should remain in the vagina for a short time in order to be impregnated by the discharge. Vaginoscopy is performed in cases of recurrent or persistent vaginitis, vaginal bleeding and clinical suspicion of a foreign body, malignancy or congenital abnormalities. Vaginoscopy offers a more thorough examination of the vagina and cervix. A thin forceps can be inserted through the canal of the vaginoscope for removal of foreign bodies as well as a cotton swab for sampling.

Treatment

Common types of vulvovaginitis are treated by simple washing with warm water and soft soap. In the presence of bacterial infection, better results are achieved by combined local and systematic administration of antibiotics [22] after vaginal cultures. The local application of antibiotics may include intravaginal injection, e.g. with a syringe. Intravaginal administration of an antibiotic should be applied for a short time in order to avoid disruption of the normal vaginal flora [6]. Candidiasis is treated with local application of antifungal ointment. Moreover, if a particular microorganism is found in the urine or in the feces, the appropriate antibiotic is administered. Parasites, found by chance in the intestine, are treated with mebendazole. Adhesion of the labia minora is treated by separating the labia using the fingers or two cotton swabs followed by application of estrogen ointment for seven days, in order for the vulva to return to its physiological condition. It is appropriate to brief the patient on prevention, by means of improvement of perineal hygiene, non utilization of chemical substances, avoidance of environmental contamination, use of cotton underwear, and effective treatment of other infections (like those of the respiratory or urinary systems).

Discussion

Vulvovaginitis is a common disorder in childhood and adolescence, constituting 87% of the genital tract pathologies of this age. It is more often observed in girls between two and seven years old. Prepubertal vulvovaginitis usually differs in terms of etiology, pathophysiology, clinical presentation and management from that occurring after menarche and in adult women, representing a separate clinical entity. While disorders of menstruation have been traditionally observed as the most common disorder of puberty, the initiation of sexual activity at a younger age today, has made pregnancy disorders, sexually transmitted diseases and vulvovaginitis the most frequent problems.

Almost every single girl is expected to suffer from vulvovaginitis at least once in her life. The etiology of vulvovaginitis includes a great variety of factors, such as microbial infections, nonspecific or specific dermatological damage, wounds, foreign bodies (paper, cotton, pieces of timber and other objects inserted deliberately or accidentally in the vagina, causing inflammation), cancer, urological infections, hormonal factors, intestinal parasites, systemic disorders, etc. Adolescents seem to be more vulnerable than adults due to either the increased number of sexual partners or the increased sensitivity to infections compared to older women who develop some kind of immunity against the microorganisms. Specific vulvovaginitis is less frequent than non-specific forms [1, 6, 21].

A delicate balance exists in the vagina, which can be easily disturbed by a variety of factors, making it easier for pathogens to develop. During childhood, infection is usually primary in the vulva with the vagina secondarily affected, while this relation is reversed in puberty after the onset of sexual intercourse, when infection of the vulva becomes almost exclusively secondary. The vulva and vagina of the child are susceptible due to the lack of estrogen and their anatomic structure, but also because of other factors like poor personal hygiene, contamination of bowel flora by posterior to anterior wiping after defecation, intimate contact of genital organs with the toilet, direct contact with sand, scratching with dirty nails, sweating, increased temperature and other local factors.

In puberty the production of the estrogens from the ovaries alters the features of vulva and vagina. The vaginal epithelium is developed, the pH is decreased, the glycogen of cells is increased and the normal flora of the vagina is developed. At the same time, the labia majora and the pubic hair are developed, the skin of the region becomes more durable and the glands start functioning. These changes are accompanied by an increased incidence of vaginitis and salpingitis compared to vulvovaginitis [3-6].

Treatment of vulvovaginitis in neonates and children has to overcome several problems. The administration of an antibiotic should be fully justified and take place only after isolation of the responsible pathogenic microorganism and according to the sensitivity test. The common question for many pediatricians and gynecologists is whether the antibiotic's concentration in the vagina reaches a satisfactory level or not, taking into account that the vagina has no glands. Many authors argue that antibiotics taken orally or through the parenteral route do not give satisfactory results.

Vulvovaginitis is a common infection in childhood and adolescence. Effective treatment constitutes a pre-supposition for no relapse of the disorder. Reassurance along with specific instructions for treatment and prevention given to the parents are of great importance. It should be mentioned that vulvovaginitis is not a contagious disease and that the child can continue with her regular activities (school, exercising, etc.) [23].

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