Testicular and scrotal abnormalities in pediatric and adult patients

ABSTRACT:
Testicular and scrotal abnormalities can occur in children, adolescents, and adults. The lesions, often accompanied by pain and swelling/enlargement of the scrotum, can cause anxiety in patients and their parents. Regardless of age, proper diagnosis is based on adequate anamnesis and physical examination. Color Doppler ultrasound is the first-line test in the differential process of testicular and scrotal diseases. Testicular and scrotal lesions require differentiation for benign and malignant processes as well as therapeutic management, including urgent surgical intervention. The aim of this paper is to present the most common causes of testicular and scrotal abnormalities in pediatric and adult patients and to outline the symptoms and diagnostic and therapeutic management.

KEYWORDS:
epididymitis, hydrocele, scrotal pain, testicular neoplasms, testicular torsion, varicocele

ABBREVIATIONS

- AFP – alpha-fetoprotein
- β-HCG – beta-gonadotropin
- CEA – carcinoembryonal antigen
- CT – computed tomography
- IgA – immunoglobulin A
- LDH – lactate dehydrogenase
- MRI – magnetic resonance imaging
- USG – ultrasound examination

INTRODUCTION

Sudden or chronic enlargement/swelling of the scrotum is a common reason to visit a doctor. A correct diagnosis is often only possible to establish with an adequate anamnesis and physical examination [1]. Still, in many cases, imaging tests are necessary – mainly Doppler ultrasound or magnetic resonance imaging (MRI) [2]. Lesions accompanied by pain and swelling/enlargement of the scrotum can induce great anxiety in patients and, in the case of pediatric patients, their parents. When interviewing the patient and his family, any previous trauma to the area and the type of sports the patient plays should be discussed. In addition, it should be determined when and whether pain, urinary disturbances, fever, and other worrisome symptoms accompany the lesions of the testes. During the physical examination, the location of the scrotal abnormality, its relationship to the testes, and the structures of the spermatic cord should be determined. Information from the anamnesis and physical examination often leads to a correct diagnosis [3]. Nevertheless, a Doppler ultrasound is recommended. It is a highly sensitive and specific test for evaluating scrotal and testicular diseases [2]. Testicular and scrotal lesions require differentiation for benign and malignant processes as well as therapeutic management, including urgent surgical intervention. The aim of this paper is to present the most common causes of testicular and scrotal abnormalities in pediatric and adult patients and to outline the symptoms and diagnostic and therapeutic management.

NON-INFLAMMATORY LESIONS

Testicular hydroceles

Testicular hydroceles are a common problem involving increased scrotal volume due to the accumulation of serous content between the peritoneal membrane and the mural membrane of the testicular capsule. This disease can affect men of any age [4].

Causes: Testicular hydroceles in children and infants result from the vaginal process failing to close after testicular descent. Secondary hydroceles, which are diagnosed in adult men or adolescents, occur most often because of inflammation of a testis or epididymis, due to trauma to a testis, during the course of testicular cancer, or following surgery for varicocele or inguinal hernia [4].

Symptoms: The characteristic sign of a testicular hydrocele is unilateral scrotal enlargement, though they can also occur bilaterally. This enlargement is usually more significant in the evening. Testicular hydroceles typically do not cause pain on palpation. Pain is caused by hydroceles resulting from a tumor or acute inflammation of a testis or epididymis. In the case of a large hydrocele, patients also complain of mobility problems. Another characteristic symptom of a hydrocele is the "translucent" sign, which is caused by the scattering of light falling on the accumulated fluid in the scrotum [4, 5].

Diagnosis: Diagnosis is based on a palpation examination, during which a medical specialist can feel the characteristic cystic lesion in the scrotum. The test that definitively establishes the diagnosis is an ultrasound examination of the scrotum, which simultaneously excludes or confirms the coexistence of other diseases, such as testicular cancer [2, 6].
A recurrent hernia is a hernia that has reappeared after previous surgery involving the closing of the persistent peritoneal vaginal process in children and evacuating the hydrocele from the scrotum. In adults, testicular hydroceles do not resolve spontaneously. They tend to enlarge in most cases, so surgery is the only effective treatment for testicular hydrops [4]. Surgical removal is performed from inguinal or scrotal access and the goal is to drain fluid from the testicular cavity. In adults, hydrocele surgery is performed using two methods, Winkelmann’s and Bergmann’s. Surgery using the Winkelmann method involves dissecting the hydrocele, evacuating the fluid from it and excising its sheaths. In the case of the Bergmann method, the excess sheaths covering the testicular hydrops are also removed during the surgery. This method is mainly used in the case of large hydrops [4]. The procedure is performed under general anesthesia and takes about an hour. After the procedure, patients should avoid intense physical activity for 2–4 weeks and should wear tight underwear to accelerate the absorption of scrotal edema [7].

**Inguinal hernia**

Hernias are caused by a worsening of tearing of the abdominal wall muscles. In the case of an inguinal hernia, the gap is formed in the muscular fascial plane of the transverse or oblique abdominal muscles. The stretched parietal peritoneum forms the hernia sac and may contain the small intestine, large intestine, visceral fat, or – less commonly – other mobile organs in the abdominal cavity [1]. There are two types of inguinal hernias: indirect inguinal hernias, which are lateral to the lower epigastric vessels, and direct inguinal hernias, which lie medial to the lower epigastric vessels. A hernia can also occur in the form of hernial gates occupying both components of the hernia (pantaloons hernia). An indirect inguinal hernia begins in the deep inguinal ring. The hernial canal is the inguinal canal. The exit site is located under the skin near the scrotum in the superficial inguinal ring [1].

A direct inguinal hernia differs from an indirect hernia in its course. It does not pass through the inguinal canal, but directly from the abdominal cavity, due to the weakening of the lower abdominal wall muscles in Hesselbach’s triangle. Its opening is also in the area of the scrotum.

A femoral hernia is a form of direct hernia where the hernia sac enters through the hiatus below the inguinal ligament into the thigh.

A scrotal hernia is a form of indirect inguinal hernia which occurs when an inguinal hernia moves through the inguinal canal and descends into the scrotum. It usually contains the small intestine (on the right side) or the large intestine (on the left side). Scrotal hernias are most common in premature babies because they have weak muscles; consequently, gaps can form in the thinner areas of their abdominal wall. A scrotal hernia can also occur in adults. The most vulnerable are men who are overweight and suffer from problems with urination (e.g., due to prostate enlargement). Patients suffering from chronic constipation and pulmonary embolism are also prone to the formation of scrotal hernias [1, 4, 5].

A recurrent hernia is a hernia that has reappeared after previous hernia surgery [1, 4].

**Treatment:** Spontaneous reabsorption of a testicular hydrocele occurs most often in children. Surgery is performed if the hydrocele has not been spontaneously reabsorbed by the child’s second birthday. Surgery involves closing the persistent peritoneal vaginal process in children and evacuating the hydrocele from the scrotum. In adult men, testicular hydroceles do not resolve spontaneously. They tend to enlarge in most cases, so surgery is the only effective treatment for testicular hydrops [4]. Surgical removal is performed from inguinal or scrotal access and the goal is to drain fluid from the testicular cavity. In adults, hydrocele surgery is performed using two methods, Winkelmann’s and Bergmann’s. Surgery using the Winkelmann method involves dissecting the hydrocele, evacuating the fluid from it and excising its sheaths. In the case of the Bergmann method, the excess sheaths covering the testicular hydrops are also removed during the surgery. This method is mainly used in the case of large hydrops [4]. The procedure is performed under general anesthesia and takes about an hour. After the procedure, patients should avoid intense physical activity for 2–4 weeks and should wear tight underwear to accelerate the absorption of scrotal edema [7].

**Causes:** In children, a hernia is a consequence of a developmental defect. It consists of the failure of the peritoneal diverticulum to close, which closes around the 20th week of pregnancy in normal prenatal development. If an inguinal hernia is diagnosed in infants, surgical treatment is usually performed as soon as possible after the diagnosis due to the relatively high risk of hernia incarceration in patients under 1 year of age. In adult patients, hernias are usually acquired. Due to differences in anatomical structure, inguinal hernias are diagnosed less frequently in women than in men. Men account for over 90% of adult hernia patients [1].

**Symptoms:** Inguinal hernias can manifest with several different symptoms. Most patients present with a visible bulge in the groin area, which is more noticeable in the upright position and when the abdominal muscles are tensed. Patients also complain of soreness or burning around the bulge that may radiate to the extremities. There may be a feeling of weakness, heaviness, or pulling in the groin. In the case of men, pain and swelling around the testicles may also occur [1]. These symptoms are exacerbated by standing upright, bending over, tensing the abdominal muscles, lifting heavy objects, and coughing. Over time, there may be a gradual enlargement of the hernia. Sometimes, the abdominal wall may tighten behind the internal organs in the hernial sac. Then the hernia becomes trapped, resulting in the internal organs in the hernial sac undergoing ischemia, which may cause tissue necrosis. Another threat is that the lumen of the compressed intestine will close and, consequently, be obstructed. Symptoms of an incarcerated hernia include nausea and vomiting, a hard stomach, fever, sudden, sharp, worsening pain, discoloration of the bulging hernia (red or bluish-purple), constipation, and bloating.

**Diagnosis:** In diagnosing an inguinal hernia, the key is a proper anamnesis and physical examination conducted by a doctor. Additional imaging tests are recommended to confirm the diagnosis or in cases where the history and symptoms suggest the presence of an inguinal hernia, though one is not detected in the physical examination. Abdominal ultrasonography, computed tomography, or MRI can help diagnose a hernia [2].

**Treatment:** Many surgical techniques have been developed, including the classic (open) method of making an incision within the abdominal integuments or groin area and minimally invasive methods using laparoscopy [8, 9]. In children, surgical treatment consists of closing the persistent vaginal process of the peritoneum. The surgeon dissects the hernial sac and sutures it at the point where it opens into the abdominal cavity. The “gold standard” in the surgical removal of an inguinal hernia in adults remains the Lichtenstein method, which allows for tension-free closure of the hernia gate gap. A unique, very durable synthetic mesh is inserted during the procedure and does not cause adverse reactions. Currently, laparoscopic methods are used more often, which allow the procedure to be performed without the need for a long incision, as is the case with the classic method. Both open and laparoscopic methods are safe for the patient. The recovery time after surgery in children is about 4 weeks; in adults, it is 4 weeks for laparoscopic surgery and about 8 weeks for the classic technique [8, 9].

**Varicocele of the spermatic cord**

A varicocele of the spermatic cord is a pathological widening of the venous vessels that are part of the spermatic cord. This disorder
mainly affects young men. In boys under 10 years of age, they are rarely observed. The prevalence increases during puberty, occurring in 14–20% of teenage boys and in a similar percentage of adult men [10].

**Causes:** The presence of a varicocele indicates venous insufficiency, leading to retrograde blood flow in the small pelvis and abdominal cavity vessels. Consequently, damage to the valvular apparatus prevents blood backflow, the widening of the veins, and the formation of varicose veins in the scrotum. Varicoceles can occur on one or both sides of the scrotum, but in 90% of cases they appear on the left side of the scrotum.

**Diagnosis:** Varicoceles are diagnosed based on a physical examination during which a characteristic thickening in the testicle is palpable. Ultrasound examination is additionally performed in the diagnostics, along with an assessment of retrograde blood flow. Adult men are also recommended to have their semen tested twice, which helps in choosing the form of treatment as well as assessing the effects of therapy.

**Treatment:** Varicose veins of the spermatic cord do not disappear independently. Surgery is the most effective treatment. In a situation where varicoceles do not cause pain or infertility, men are only asked to observe whether their testicles are enlarged. Surgical treatment becomes necessary when there is pain or an inability to conceive a child. Surgical treatment is also recommended for boys during puberty in order to inhibit the increased volume of the affected testicle. The operation is performed under general anesthesia using the classic (open), laparoscopic, or microsurgical technique.

During the operation, the surgeon locates dilated vessels and then ligates, clips, or coagulates them. A new method of treatment is using the classic (open), laparoscopic, or microsurgical technique. The recovery time after the procedure depends on the surgical technique and ranges from about 2–3 weeks (for the laparoscopic approach) to 4 weeks (for the classic technique) [10].

### INFLAMMATORY LESIONS

**Epididymitis and/or orchitis**

Epididymitis and orchitis are inflammatory conditions which usually occur in the ascending path from the bladder, urethra, and prostate. Acute epididymitis is often accompanied by acute inflammation of the orchid to which the epididymis is attached; in such cases, it is referred to as “acute epididymo-orchitis” [11].

**Causes:** Epididymitis is most often caused by a bacterial infection and develops as a complication of urinary tract infection when there is an obstacle to the proper outflow of urine from the bladder (e.g., urethral stricture). This form of epididymitis is observed in children and older men, where inflammation may be associated with prolonged bladder catheterization. Other causes of inflammation include sexually transmitted diseases. The most common microorganisms causing epididymitis are gonorrhea and chlamydia. This form of epididymitis primarily affects younger men. Epididymitis may also be a complication after urological procedures (e.g., resection of the prostate or procedures in the urethra). Another cause of epididymitis is viral parotitis (mumps). This happens in up to 20–30% of boys after puberty [12]. Epididymitis can also be caused by amiodarone, a drug used to treat abnormal heart rhythms. Men with tuberculous of the lungs or kidneys may also develop tuberculous epididymitis [12].

**Symptoms:** Epididymitis (often concomitant epididymo-orchitis) is an acute condition with pain in the scrotum, usually unilateral, with swelling of the mid-scrotum and pain on palpation. The skin of the scrotum may be red. The testicle on the affected side may be elevated and enlarged.

Symptoms may be associated with urinary tract infection (more frequent urge to urinate, pain, or burning during voiding). Symptoms of urethritis (burning or discharge from the urethra) may also occur. There may also be symptoms of prostatitis (pain in the perineum or at the base of the penis). Typically, there are no general symptoms of infection, such as fever, general malaise, vomiting, or headache. If such symptoms do occur, they are usually caused by a urinary tract infection or prostatitis. When epididymo-orchitis is caused by parotitis, fever, malaise, and painful salivary gland swelling develop 3–5 days earlier. In chronic epididymitis, there is mild pain in the scrotum for weeks, which goes away and recurs, and thickening may be felt at the epididymal site [11, 12].

**Diagnosis:** A detailed anamnesis and physical examination are needed for a proper diagnosis. Urine analysis and culture are performed when symptoms indicate urinary tract infection. Doppler ultrasound may also help assess testicular flows [2, 11, 12].

**Treatment:** The treatment is antibiotic therapy. If a sexually transmitted infection is not involved, the doctor will prescribe a fluoroquinolone antibiotic (e.g., ciprofloxacin or ofloxacin) for 10–14 days. If a urinary tract infection is present and a urine culture has been performed, the antibiotic is selected based on the culture result [11]. If the epididymitis does result from a sexually transmitted infection and symptoms of urethritis are present, the doctor will prescribe an antibiotic to treat urethritis. It is usually unknown whether it is gonococcal or non-gonococcal urethritis; therefore, oral azithromycin is generally recommended, since it is practical for both forms of urethritis. If gonorrhea is diagnosed, ciprofloxacin or ofloxacin for 7 days or a single intramuscular injection of ceftriaxone can be prescribed. For non-gonococcal infection, oral doxycycline can be used for 7 days. It is also necessary to treat all sexual partners. In chronic epididymitis, antibiotics are used for 6–8 weeks. Supportive treatment for epididymitis consists of rest with scrotal elevation and wearing tighter underwear during activity to keep the scrotum immobilized and relieved. Painkillers and anti-inflammatory drugs additionally reduce pain and swelling. Surgery may be needed when an abscess in the scrotum or a twisted appendage causes inflammation. Removing the epididymis or testis may even be necessary when severe purulent inflammation occurs...
or when chronic epididymitis causes persistent pain that cannot be treated otherwise [1, 11, 12].

**Henoch-Schönlein purpura**

Henoch-Schönlein purpura (IgA-associated vasculitis) is a disease in which the small blood vessels – arterioles and venules – become inflamed. Typically, small-vascular vasculitis affects the skin, digestive tract, joints, kidneys, and testes. The disease is most common in children between 4 and 10 years of age [13].

**Causes:** The causes of the disease cannot be clearly explained. It usually begins after or during an infection. The most common are upper respiratory tract infections (streptococcus) or gastritis caused by Helicobacter pylori. The disease can occur after contracting chickenpox, measles, rubella, or hepatitis B or after infection with parvovirus B19, mycoplasmas, Coxsackie virus, or herpes simplex virus. Immune complexes consisting of antibodies (IgA) and antigens are deposited in the walls of small blood vessels, leading to local inflammation, impaired blood flow, and local foci of necrosis.

**Symptoms:** The most characteristic symptom of Henoch-Schönlein purpura is a skin rash. There is also joint pain, swelling, and warming, often with restricted mobility. Abdominal pain is also possible. Symptoms of kidney involvement are usually mild and produce hematuria and proteinuria. Central nervous system and lung involvement or pain and swelling of the scrotum may also occur [13, 14].

**Diagnosis:** Proper diagnosis is based on a detailed history and physical examination, but additional tests (complete blood count, coagulation test, markers of kidney and liver function, and inflammation) should be ordered. Urinalysis and fecal occult blood testing are necessary [14].

**Treatment:** There is no causal treatment. The type and intensity of symptomatic treatment depends on organ involvement and the severity of symptoms. The disease is usually mild and resolves spontaneously within 4–6 weeks of the first symptoms. Follow-up urinalysis is required after the child’s symptoms have resolved, as kidney involvement may not become apparent until several weeks after the onset of the disease. Patients are usually followed-up for at least 6 months [13, 14].

**TRAUMATIC LESIONS**

**Injury of the scrotum or testicle (hematoma, hematococele, or testicular tear)**

Injuries to the testes and scrotum most often affect young men. The consequences of injuries can be trivial, but can also result in the loss of an organ. Depending on the extent of the damage, a distinction can be made between a hematoma, a hematococele, and a testicular rupture. The severity of the injury affects proper diagnosis and appropriate treatment [15].

**Causes:** Testicular injuries most often affect men between the ages of 15 and 40 and are caused by work-related injuries: blunt injuries that cause severe bruising. The second group comprises injuries sustained in traffic accidents and beatings and those resulting from the practice of selected sports, such as soccer or martial arts [15].

**Diagnosis:** When diagnosing testicular trauma, a physical examination should be followed by ultrasonography, often combined with Doppler ultrasound, to assess testicular blood flow. In some cases, other imaging studies, such as computed tomography of the pelvis, may be necessary [2, 3, 15].

**Treatment:** Therapy for testicular injuries depends on the extent of the injury. If the scrotal skin is damaged, it is possible to cover them with skin grafts, for example, from the perineal or thigh area. If all the scrotal skin has been destroyed, but the testicles remain, they can be sewn under the skin of the groin. For testicular injuries, non-surgical treatment is possible only if the damage results in a closed contusion of the testicle without a hematoma. In other situations, surgical intervention is necessary. If there is only a hematoma, it should be decompressed, and after a visual inspection of the testicle, the treatment can be completed. If the testicular sheath has been torn, it should be sutured. Fragmentation of the testicle makes it impossible to preserve it, and the appropriate treatment in such cases is amputation of the testis [15].

**NEOPLASTIC LESIONS**

**Skin cysts and skin neoplasms of the scrotum**

Cysts and skin neoplasms of the scrotum are rare in children and mostly observed in adults. Because sebaceous and epidermoid cysts do not connect with the content of the scrotum, their diagnosis is relatively easy. Leathery cysts form deep in the scrotal wall along the midscrotal suture. Their deep location may make differentiation difficult [16].

**Symptoms:** Lesions are usually asymptomatic, but sometimes they can cause pain (spontaneous or associated with pressure). Relatively soft, flexible structures are palpated. Such lesions can be of different sizes.

**Diagnosis:** Proper diagnosis is made possible by ultrasound examination of the scrotum, often combined with Doppler ultrasonography.

**Treatment:** An incidentally detected lesion that does not cause any symptoms can be observed by ultrasonography. The final diagnosis requires the removal of the lesion. Surgical treatment is necessary when there is pain, enlargement of the lesion, or other disturbing symptoms [16, 17].

**Epididymal cyst (spermatocele)**

An epididymal cyst is a benign lesion that often develops in young men.

**Causes:** It is characterized by disorders in the flow of sperm through the structures of the epididymis and arises due to blockage of the sperm outflow tract. The diagnosis is often made accidentally [18].

**Symptoms:** Small cysts are usually asymptomatic. Diagnosis is made during an incidental examination of the scrotum. On palpation, a thickening or nodule above the testicle is palpated. Larger cysts can cause the entire scrotum to enlarge. Symptoms such as pain, swelling, a feeling of heaviness in the scrotum, and redness are also possible [18].
Diagnosis: The diagnosis is determined through an interview and physical examination. During the test, the illumination of a suspicious lesion with a flashlight will show its translucence because the cyst is filled with fluid. Proper diagnosis is made possible by ultrasound examination of the scrotum [18, 19].

Treatment: Small seminal cysts, less than 1 cm in diameter, do not require treatment. They can self-absorb. Surgery is necessary if the cyst is large or enlarges or causes discomfort. Surgical treatment can be performed through an incision in the scrotum and debridement of the cyst from the vas deferens or by draining the fluid in the cyst and introducing an agent inside that will stick to the cyst's walls [19].

Testicular neoplasm (benign and malignant)

Testicular tumors can be either benign or malignant. Most tumors appear as solid masses inside the testis. Usually, they are not painful. There are different types of benign tumors of the testicle, such as teratoma, sex cord stromal tumor, lipoma, hemangioma, and fibroma. Malignant testicular tumors usually occur in males between the ages of 15 and 35. The most common is seminoma, but teratomas, yolk sac tumors, embryonal carcinomas, and choriocarcinomas are also observed [20, 21]. Testicular cancer is one of the most common malignant tumors in men aged 20 to 44, and the incidence continues to increase. The 5-year survival rate among men in the early stages of the disease is almost 100%. This percentage is much lower among patients with metastases at diagnosis, standing at about 50% [20, 21].

Symptoms: The first symptom of a testicular tumor may be a hard lesion in the scrotum. In addition, there is swelling and fluid in the scrotum, which gives a feeling of heaviness. Sometimes, the first symptoms are back pain, abdominal pain, hemoptysis, supraclavicular tumor, and gynecomastia [21].

Diagnosis: As always, diagnosis is based on a physical examination of the patient. Necessary imaging examinations include testicular ultrasound, Doppler ultrasound, abdominal ultrasound, and chest computed tomography. Blood tests include chorionic beta-gonadotropin (β-HCG), lactate dehydrogenase (LDH), carcinoembrional antigen (CEA), and alpha-fetoprotein (AFP) [1, 3, 20, 21].

Treatment: A testicular resection is performed through an incision in the groin, through which the entire testicle is removed along with the cord. Sometimes it is necessary to perform a laparoscopic or classical operation to remove retroperitoneal lymph nodes infiltrated by cancer. Once the stage of the disease is determined, the type of further treatment using radiotherapy or chemotherapy can be selected [20, 21].

OTHER REASONS

Idiopathic swelling of the scrotum

Idiopathic scrotal edema is a rare, benign, usually self-limiting disease. It typically affects boys aged 5–9, but can also occur in adults.

Causes: The exact etiology of the disease is unknown. An allergic reaction caused by an insect bite or a sudden temperature change have been suggested [22].

Testicular or epididymal attachment torsion

Testicular or epididymal attachment torsion is most common in males between the ages of 15 and 20.

Symptoms: Pain associated with torsion of the testicle or epididymis is often precisely located in the upper part of the scrotum. The pathognomonic symptom is the so-called “blue spot” associated with necrosis of the twisted appendage and visible through the thin skin of the scrotum as bruising. In addition, swelling and redness appear, the severity of which also depends on the duration of the symptoms [1].

Diagnosis: Diagnosis is based on an appropriate anamnesis and physical examination. The “blue spot” can often be seen. Color Doppler ultrasound is helpful for possible visualization of a twisted appendage, inflammation, and increased blood flow through the testicle [2].

Treatment: Surgical treatment is still the standard and entails removing the attachment from the access through the scrotum [1, 3].

Testicular torsion

Testicular torsion is the rotation of the testicle several times around the long axis of the spermatic cord, usually from the outside to the inside. Initially, the outflow of venous blood is disturbed and the arterial blood supply to the gonad is limited. It is most common between the ages of 15 and 20 and in children up to 3, but it can occur at any age. An extrathecral or intrathecral torsion of the testis or epididymis is possible [23, 24].

Symptoms: The predominant symptom is sudden unilateral pain in the scrotum or testis. It is constant, unrelated to body position, and without fever, nausea, or vomiting, although such symptoms are possible. Torsion may be related to exercise or injury to the scrotum, but may also occur during sleep. On examination, the scrotum is enlarged, swollen, and hyperemic. The testis is very painful, usually elevated, and may be transverse. Prehn’s sign is helpful in the differential diagnosis (in the case of torsion, elevating the testicle increases the pain, while in orchitis or epididymitis it relieves it) [23, 24].

Diagnosis: A detailed physical examination is used for the diagnosis; Doppler ultrasound is helpful when testicular artery flow is weak or absent [2].

Treatment: Treatment of testicular torsion is always surgical and should be undertaken urgently, as surgery performed within 4 to 6 hours from the onset of the first symptoms provides a chance to save the gonad. It consists of unscrewing the testicle and fixing...
it to the sheaths. Fixation of the second testicle should also be a routine procedure because the predisposition to torsion may exist in both sides. Delayed diagnosis and treatment cause necrosis and the organ may need to be removed [23–25]. Before surgery, the testicle can be “unscrewed” (outward, like “opening a book”), but even a successful maneuver and the disappearance of pain symptoms do not remove the need for surgery [23, 24].

DISCUSSION

Scrotal abnormalities are among the most common reasons for patients to visit the emergency department. In some cases, testicular diseases require surgical intervention. Some disorders only require observation. In some cases, scrotal disease can be diagnosed electively. However, proper differentiation of scrotal abnormalities and adequate diagnosis are important [1, 2]. Testicular hydroceles is a common cause of scrotal enlargement. It can affect children and adults, though with some differences in etiology, clinical presentation, and management. Most hydroceles in children are congenital and occur due to the persistent vaginal process of the peritoneum and the communication between the peritoneal cavity and the scrotum. In some cases, hydroceles in children may develop secondary to infection, trauma, or testicular torsion. A significant proportion of congenital hydroceles resolve spontaneously within the first year of life. Surgical intervention may be considered if the hydrocele persists beyond the first year of life or grows more prominent. Initially, observation of small and asymptomatic hydroceles in children is recommended. Surgical repair may be necessary for more significant or symptomatic hydroceles that persist over the first year or if complications occur (e.g., hernia or testicular torsion) [4]. In adults, the etiology of primary hydroceles is often idiopathic, resulting from an imbalance in the production and reabsorption within the tunica vaginalis. Secondary hydroceles can occur due to trauma, infection, tumors, or inflammation around the testicles. Hydroceles in adults can present as a gradual, painless enlargement of the scrotum over time [5]. Some patients may experience heaviness or mild scrotal discomfort due to the increased size of the hydrocele. In adults, a hydrocele is unlikely to go away independently and often persists or gradually increases in size. Initial management may include observation and conservative treatment if the hydrocele is small and asymptomatic and does not cause significant discomfort or impairment of daily activities. A surgical intervention, a hydrocectomy, is considered when the hydrocele becomes bothersome, causes pain, or affects the patient’s quality of life [7].

Inguinal hernia, like hydrocele, can occur in children and adults, but differs in etiology, clinical presentation, and management. Inguinal hernias in children are usually congenital, but in some cases, hernias in children can be acquired; these are caused by increased pressure in the abdominal cavity, such as chronic cough or constipation [1, 8].

Inguinal hernias in children have a higher risk of strangulation, where the content of the hernia becomes trapped and cannot be retracted back into the abdominal cavity. This situation requires urgent surgical consultation and even emergency surgery, which is always associated with greater risk than elective surgery [8].

Inguinal hernias in adults are mainly acquired due to a weakening of the abdominal wall, often due to age, repetitive straining, chronic cough, obesity, or previous abdominal surgery. Inguinal hernias in adults can also cause them to become incarcerated, which may lead to urgent surgical intervention. Elective surgery is recommended to avoid the risk of entrapment or strangulation [9].

Varicose veins of the spermatic cord can occur in both children and adults. Children are usually primary (idiopathic), resulting from developmental abnormalities or impaired venous outflow mechanisms. Most varicoceles in children are left-sided due to the left testicular vein’s longer and more oblique course. Children with varicoceles may have scrotal swelling that may be more pronounced when standing or exercising. They may feel a dull pain or discomfort in the scrotal area, especially after physical activity. Varicoceles in children can affect the growth and development of the testicles, potentially reducing the size of the testicles on the affected side [10].

Asymptomatic or mild varicoceles in children may initially be treated with observation, considering the possibility of spontaneous resolution or improvement. Surgery may be recommended for symptomatic varicoceles or when there is evidence of impaired testicular growth, usually through a varicocelectomy. Varicoceles in adults are usually secondary to an underlying condition such as obstruction or compression of the venous drainage system, possibly due to retroperitoneal or intra-abdominal tumors. As with varicoceles in children, varicoceles in adults are also more common on the left side due to the anatomy of the venous system [10]. Varicoceles in adults can affect sperm production and quality, potentially leading to infertility or reduced fertility. For adults with mild or asymptomatic varicoceles, conservative measures such as scrotal support or painkillers may relieve discomfort. Varicocelectomy, the surgical removal or ligation of the affected veins, is recommended for symptomatic varicoceles or where infertility or reduced fertility is an issue [10].

Epididymitis and orchitis are inflammatory conditions that, although they share similarities in clinical presentation and management in children and adults, nevertheless present differences. In children, epididymo-orchitis is usually caused by viral or bacterial infections. In some cases, anatomic abnormalities or defects in the genitourinary system may contribute to the development of epididymitis or orchitis [11]. In adults, epididymo-orchitis is often caused by sexually transmitted infections with Chlamydia trachomatis or Neisseria gonorrhoeae. Non-sexually transmitted urinary tract infections can also lead to epididymitis or orchitis in adults. In adults, laboratory tests such as urinalysis and urine culture may be performed to identify the causative organism [11].

Henoch-Schönlein purpura is a systemic vasculitis that mainly affects children but can also occur in adults. The condition is believed to be driven by an abnormal immune response in children and adults. It typically involves the skin, joints, gastrointestinal tract, and kidneys, with testicular involvement being a less common manifestation. Laboratory tests may be performed to evaluate markers of inflammation and kidney function. Ultrasonography, as always, may be helpful in the differentiation [14].

Injuries to the scrotum can occur in children and adults for various reasons. Children can sustain scrotal injuries due to accidental falls, bicycle accidents, or other activities involving direct damage to the scrotum. Initial management includes using ice packs, scrotal support, and painkillers to relieve pain and swelling. It is worth using Doppler ultrasound examination for differential diagnosis. Surgical treatment may also be necessary, depending on the extent of the injury. The causes of scrotal injury in adults, as...
in children, can be trauma, accidents, or sports-related incidents. Some occupations can put adults at risk of scrotal injuries, such as those in manufacturing or construction. Diagnosis and treatment are the same as in pediatric patients. A urological consultation may be necessary for extensive damage in both age groups [15, 26].

Testicular neoplasms comprise a diverse group of tumors, with differences in incidence, histology, and treatment strategies between the pediatric and adult populations. Testicular tumors are rare in children. Age-specific testicular germ cell tumors, especially yolk sacs and teratomas, are the most common histological types in children. Some testicular neoplasms may be related to the problem of undescended testicles [20, 21]. Surgical removal of the testicle (orchiectomy) is the standard treatment for most testicular neoplasms in children. Depending on histology, stage, and risk stratification, chemotherapy may reduce the risk of recurrence or metastasis. Radiation therapy is acceptable in older age groups [20, 21, 27].

Testicular cancers in older people are most often diagnosed in young adults, usually between the ages of 15 and 40. Seminal and non-seminoma tumors account for most testicular cancers in adults. Therapeutic management includes surgical treatment, chemotherapy, and possible radiotherapy, depending on the stage [21]. In both groups, rapid diagnosis, accurate diagnosis, and appropriate management, including surgical intervention and adjuvant therapy, are critical to achieving favorable outcomes. Multidisciplinary cooperation between pediatric oncologists, pediatric urologists and medical oncologists, and adult urologists and oncologists is essential in providing comprehensive care to patients with testicular cancer.

Idiopathic testicular swelling occurs in both children and adults, but there are differences between the two groups. It is relatively common in prepubertal boys and often resolves spontaneously. Children with idiopathic testicular swelling usually have painless, unilateral or bilateral testicular enlargement that resolves spontaneously and requires observation rather than treatment. In adults, it is less common than in children. The differential diagnosis must include other testicular pathologies such as testicular torsion, epididymitis, or tumors. Unlike in children, idiopathic testicular swelling in adults can persist or recur. Ultrasound, blood tests (including inflammatory and cancer markers), and testicular biopsy may be necessary. The choice of treatment depends on the result of the diagnosis [22].

Testicular or epididymal appendage torsion is an emergency that can be observed in children and adults. It is worth significantly re-emphasizing the role of Doppler ultrasonography when differentiating this condition – from testicular torsion in particular. The standard of care is the surgical revision of the scrotum and removal of the twisted appendage. However, some publications suggest antibiotic therapy without surgical intervention in this case. Torsion of the testis or epididymis appendage is less common in adults than children. It can occur at any age, but is more common in young adults. Both diagnostic and therapeutic procedures are the same as in the pediatric group [25, 28].

Testicular torsion is an emergency condition. The underlying mechanism is the same in both pediatric and adult age groups. The factors predisposing one to torsion may be anatomical. Doppler ultrasonography is the primary imaging modality for assessing testicular blood flow. However, false negative results may occur [29]. If the clinical picture suggests testicular torsion, a surgical revision is necessary. Still, an incision is performed in the inguinal canal due to the possibility of a tumor causing the torsion [30]. Testicular torsion can occur at any age in adults, although it is less common than in children and adolescents. It would be best to remember the increased probability of testicular torsion due to a tumor and to take extreme caution during surgery [23, 24, 25, 30].

**CONCLUSIONS**

The differential diagnosis of scrotal abnormalities includes various diseases for different age ranges, in both children and adults. These lesions can be inflammatory, traumatic, neoplastic, or unexplained. Traumatic and inflammatory lesions are more common in children than adults, whereas neoplastic lesions are observed more often in the

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**Tab. I. Summary of the correct diagnostic and therapeutic procedures, by the type of scrotal abnormality.**

<table>
<thead>
<tr>
<th>SCROTAL ABNORMALITY</th>
<th>DIAGNOSIS</th>
<th>TREATMENT</th>
<th>SURGERY</th>
<th>URGENCY OF MEDICAL INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testicular hydrocele</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Inguinal hernia</td>
<td>+/-</td>
<td></td>
<td>+/-</td>
<td>+ (in case of incarcerated)</td>
</tr>
<tr>
<td>Varicocele of the spermatic cord</td>
<td>+</td>
<td>-</td>
<td>O</td>
<td>+/-</td>
</tr>
<tr>
<td>Epididymitis and/or orchitis</td>
<td>+</td>
<td>-</td>
<td>A</td>
<td>+</td>
</tr>
<tr>
<td>Henoch-Schönlein purpura</td>
<td>+/-</td>
<td>-</td>
<td>O</td>
<td>-</td>
</tr>
<tr>
<td>Hematoma</td>
<td>+</td>
<td>+</td>
<td>O/A</td>
<td>-</td>
</tr>
<tr>
<td>Hemothorax</td>
<td>+</td>
<td>+</td>
<td>A</td>
<td>+</td>
</tr>
<tr>
<td>Testicular tear</td>
<td>+</td>
<td>+</td>
<td>A</td>
<td>+</td>
</tr>
<tr>
<td>Skin cysts and skin neoplasms</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+/-</td>
</tr>
<tr>
<td>Epididymal cyst</td>
<td>+</td>
<td>-</td>
<td>O</td>
<td>+/-</td>
</tr>
<tr>
<td>Testicular neoplasm</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+/-</td>
</tr>
<tr>
<td>Idiopathic swelling</td>
<td>+</td>
<td>-</td>
<td>O</td>
<td>-</td>
</tr>
<tr>
<td>Torsion of testicull, epididymal attachment</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Testicle torsion</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

USG – ultrasound examination; CT – computed tomography; MRI – magnetic resonance
latter. Each testicular and scrotal lesion requires medical consultation with an ultrasound examination. The therapeutic course, including surgery, depends on the medical examination (Tab. I).

REFERENCES

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