27 The Male Reproductive System

Objectives
In this chapter we will study
- the common symptoms of disorders of the male reproductive system;
- diagnostic procedures for examining the male reproductive system;
- the causes and course of gynecomastia;
- the scrotal disorders hydrocele, varicocele, and spermatocele;
- several testicular disorders—ectopic testis, torsion of the testis, and testicular cancer; and
- prostatic disorders, specifically prostatitis, benign prostatic hyperplasia, and prostate cancer.

Assessment of the Male Reproductive System
Because the male reproductive system is closely related to the urinary system, many of the same diagnostic procedures are used to evaluate both. Additional physical evaluations and laboratory tests are available for assessing the reproductive system alone.

Pain is one of the most common symptoms of male reproductive system disease. It may be diffuse pain in the groin or pain localized to a specific area, most often one of the testes. Since the penile urethra is the passageway for both urine and semen, painful urination may indicate either a urinary or a reproductive system disorder. Males may also experience discharge from the urethra. This is one of the most frequent symptoms of a sexually transmitted disease (STD), or it may arise from inflammation of the epididymis (epididymitis) or the prostate gland (prostatitis).

Testicular pain may indicate an STD, testicular torsion, cancer, or cryptorchidism (failure of one or both testes to descend into the scrotum). Pain in the groin may be due to a muscle pull, an STD, or an inguinal hernia. Men also seek medical attention for infertility and erectile dysfunction.

Physical Examination
When obtaining a patient history in cases that involve the reproductive system, the clinician inquires about the patient’s sexual history and practices as well as the onset of the symptoms relative to the most recent sexual contact. Because these are such personal questions, the clinician must assure the patient that honest answers are essential to an accurate diagnosis and that the information will remain confidential.

Examining the external genitalia and palpating the prostate gland are routine. Because many STDs produce characteristic lesions on the penis or scrotum, these structures are inspected for vesicles, chancres, or warts. The color and texture of the skin are also noted. Excessive redness may indicate inflammation, while dry, scaly skin may be a sign of fungal infection (“jock itch”) or a nutrient imbalance. If the man has not been circumcised, the foreskin should be retracted and the glans examined. Inflammation of the prepuce or adjacent tissues prevents retraction of the foreskin, a condition called phimosis.

Following visual inspection, the scrotum, testis, epididymis, and ductus deferens are palpated on both sides, and a digital rectal examination (DRE) is conducted. Palpation allows the clinician to check for inflammation, edema, masses, or other abnormalities as well as to determine whether both testes are present and in the proper location. A DRE involves palpating the prostate and seminal vesicles through the anterior rectal wall by inserting a gloved finger into the rectum. The DRE is used to screen for prostate disease and inflammation of the seminal vesicles. If urethral discharge appears at any time during the physical examination, it is cultured for pathogenic microbes.

Laboratory Tests and Imaging Methods
If the patient history and physical examination indicate that further tests are advisable, a variety of diagnostic procedures are available. Blood samples are examined for reproductive hormones (testosterone, estradiol, luteinizing hormone, and follicle-stimulating hormone) and antibodies.
against organisms that cause STDs, such as *Treponema pallidum* and HIV. A high level of prostate-specific antigen (PSA) and alkaline phosphatase may suggest prostate cancer, while α-fetoprotein and human chorionic gonadotropin (HCG) point toward testicular cancer.

Semen analysis includes measures of semen volume and sperm count and assessment of sperm motility and morphology. The composition of the semen is also determined if abnormal function of one or more of the accessory glands is suspected. Either the semen or a urethral discharge may be cultured for the presence of infectious agents that cause various STDs. Finally, a biopsy may be done if cancer or abnormal structure and function at the cellular level is suspected.

X-ray, CT, MRI, and sonography can be used to help diagnose cancer and congenital abnormalities of the reproductive organs. In sonography, the ultrasound transducer is inserted into the rectum so that the ultrasound waves travel only a short distance to the prostate and back, and a clearer image is produced. Sonography is also helpful in directing biopsy needles to the appropriate location, since it produces a real-time image of moving objects.

**Gynecomastia**

Gynecomastia, enlargement of the male breast, affects upwards of 40% of men in the United States and is seen most often in adolescents and men over the age of 50. It occurs when the ratio between testosterone and estrogen shifts in favor of estrogen, a phenomenon that tends to happen in men during puberty and aging. A variety of conditions can shift the testosterone/estrogen ratio. Hypogonadism, Klinefelter syndrome, cirrhosis and hepatitis, hyperthyroidism, tuberculosis, and cancers of the testicles, adrenal glands, and liver can cause gynecomastia. It can also result from drugs such as estrogen supplements, amphetamines, digitalis, spironolactone, ergotamine, and certain antidepressants.

Gynecomastia is readily diagnosed by physical examination. The breast stroma shows hyperplasia, producing a palpable mass (at least 2 cm in diameter) beneath the areola. Gynecomastia usually regresses spontaneously—the pubertal form within 4 to 6 months and the senescent form within 6 to 12 months. If it does not, or if an underlying treatable cause is known, that cause should be treated. Breast regression then usually follows within 12 months. If it does not, the man is instructed in breast self-examination since persistent gynecomastia can develop into breast cancer. Breast cancer occurs in about 1 male for every 275 female patients and accounts for about 0.2% of cancer cases among American males.

**Scrotal Disorders**

Some common noncancerous disorders of the scrotum are hydrocele, varicocele, and spermatocele. All can be detected by palpation.

**Hydrocele**, a collection of fluid in the tunica vaginalis, is the most common cause of scrotal swelling. It results from increased fluid production (often due to inflammation) or decreased reabsorption caused by either lymphatic or venous blockage. The underlying cause is usually trauma or infection of the testis or epididymis, but some cases are idiopathic. Hydroceles vary from pea-sized to bigger than a grapefruit. They can compress the testicular artery and vein, thus reducing testicular circulation and leading to atrophy. Hydrocele is treated by aspirating the accumulated fluid. If it recurs, a sclerosing drug is injected into the scrotum to induce scarring of the tunica vaginalis in an attempt to prevent recurrence. If this fails, the tunica vaginalis is surgically removed.

**Varicocele**, abnormal dilation of veins in the spermatic cord, typically occurs immediately after puberty. It is said to feel “like a bag of worms.” This disorder is caused by failure of the valves in the spermatic veins to prevent the backflow of blood. More than 95% of varicoceles occur on the left; the presence of a unilateral right-side varicocele indicates obstruction or compression of the inferior vena cava. A varicocele reduces testicular blood flow, which can lead to decreased spermatogenesis and infertility. Surgical ligation or inducement of slight sclerosis of the vein corrects the varicocele.

**Spermatocele**, a swollen aggregation of sperm in the epididymis, is difficult to distinguish from a hydrocele by palpation. Diagnosis is based on aspiration of fluid from the mass. The fluid in a hydrocele is clear, while the fluid in a spermatocele is milky and contains sperm cells. Spermatoceles are usually caused by inflammation and tend to resolve spontaneously. Most are asymptomatic, and unless discomfort or pain occurs, excision is not recommended.
Testicular Disorders
Disorders of the testis include ectopic testis, cryptorchidism, testicular torsion, and testicular cancer. Because the testes are the sites of spermatogenesis and androgen production, these disorders have potentially negative effects on both fertility and secondary sex characteristics.

Cryptorchidism and Ectopic Testis
Cryptorchidism and ectopic testis are similar congenital conditions in which descent of the testis is incomplete (in the first case) or has taken an abnormal route (in the second). In cryptorchidism, the descending testis stops in the pelvic cavity, inguinal canal, or upper end of the scrotum. An ectopic testis ends up in the perineal or suprapubic region or just beneath the skin of the thigh. Cryptorchidism can result from adhesions along the path of descent, an inguinal canal too narrow for the testis to pass through, an absent or abnormal gubernaculum, a too-short spermatic cord, and other causes. Ectopic testis results from a gubernaculum connected to the wrong site at its distal end, so that it pulls the descending testis to an abnormal location. Palpating the scrotum during the physical examination reveals the absence of the testis. Imaging techniques such as ultrasound, MRI, and CT scans are used to locate testes that cannot be found by palpation.

In both disorders, the testis is hormonally functional but is too warm for spermatogenesis. Fertility may be normal if only one testis is affected, but in bilateral cases the patient is sterile. If the condition is not corrected, the risk of testicular cancer is 35 to 50 times higher than normal. An ectopic testis is normally removed to prevent cancer. The surgical removal of a testis is called orchiectomy. In cryptorchidism, an injection of human chorionic gonadotropin can often stimulate completion of descent. If this fails, the testis is surgically relocated to the scrotum in young boys (a procedure called orchiopexy), but because of the cancer risk, orchiectomy is performed in boys over 10 years old and in men.

Testicular Torsion
Testicular torsion, twisting of the testis on the spermatic cord, may occur spontaneously or as a result of trauma or strenuous exercise. It occurs most often during puberty, but may happen at any time of life. Twisting the testicular blood vessels causes testicular ischemia, and if left untreated, necrosis of the testis. Testicular torsion also produces scrotal swelling that is not alleviated by rest or support of the testis. The patient complains of severe pain and nausea, and may vomit. Fever is common. Treatment is aimed at alleviating the torsion by manually rotating the affected testis or by surgery. Unless corrected within 4 to 6 hours, damage to the testis can permanently impair fertility.

Testicular Cancer
Testicular cancer is relatively rare, accounting for less than 1% of all cancers in men. It is also one of the most treatable cancers, with a cure rate exceeding 95%. Nevertheless, it causes about 350 deaths per year in the United States, mostly because it is not detected or treated in time to prevent metastasis. Up to 10% of men with testicular cancer are asymptomatic. Most victims are 15 to 34 years old. White men have about four times the incidence of testicular cancer that black men do, and within both groups, men of higher economic status have higher rates of testicular cancer. Some other risk factors for testicular cancer are high androgen concentrations and heredity. Brothers and especially identical twins show higher shared incidence of testicular cancer. The best defense against testicular cancer is testicular self-examination (TSE). This is best done after a shower because heat relaxes the scrotum. The testes should be gently rolled between the thumb and fingers, feeling for suspicious lumps. A slight inequality in size is normal. TSE should be as routine for men as breast self-examination (BSE) is for women.

Most testicular tumors arise from germ cells. The first sign of a tumor is an enlarged but often painless testis. Its continued growth causes lower abdominal aching or a feeling of testicular “heaviness.” Epididymitis, gynecomastia, or hydrocele may develop. Because up to 25% of cases are misdiagnosed at first, testicular cancer often metastasizes, especially to the lungs, lymph nodes, and central nervous system. Metastasis to the lungs causes cough, dyspnea, and hemoptysis. Neural effects range from alterations in vision and mental status to seizures.

Diagnosis is achieved by palpation, imaging, and blood tests for such serum markers as α-fetoprotein, HCG, and lactate dehydrogenase. The affected testis is surgically removed, and metastasis is treated with
radiation and chemotherapy. The prognosis depends on the tumor type and degree of metastasis. Most deaths occur within 2 years, and a disease-free survival time of 3 years is considered a cure. As evidence that men who survive testicular cancer can live a normal life, consider Lance Armstrong, one of the best professional cyclists in the world. After diagnosis and treatment for testicular cancer, Armstrong returned to training. In both 1999 and 2000, he won the Tour de France, a grueling 3-week, 2,300-mile cross-country bicycle race.

**Prostatic Disorders**
The most common disorders of the prostate are prostatitis, benign prostatic hyperplasia, and prostate cancer.

**Prostatitis**
Prostatitis, or inflammation of the prostate, is seen in up to 36% of males in the United States. It occurs in bacterial and nonbacterial forms. Bacterial prostatitis is usually caused by *Escherichia coli, Pseudomonas*, and *Streptococcus faecalis*. Its signs and symptoms are identical to those of a urinary tract infection, including dysuria, frequent urination, nocturia, and a weak urine stream. The patient may have a fever, fatigue, and pain in the joints, muscles, lower back, or rectum. The prostate is firm, swollen, tender, and painful. Treatment employs broad-spectrum antibiotics for up to 42 days, analgesics, bed rest, and ample water intake.

Nonbacterial prostatitis is more common and has an unknown cause. It, too, is characterized by symptoms similar to those of a urinary tract infection, along with pain in the infrapubic, suprapubic, scrotal, penile, or inguinal regions and pain upon ejaculation. Diagnosis is based on the absence of an infectious agent in urine cultures or prostatic fluid and inflammation of the prostate as confirmed by examination. Treatment varies, but usually includes bed rest, anti-inflammatory agents, and anticholinergics.

**Benign Prostatic Hyperplasia**
Benign prostatic hyperplasia (BPH), noncancerous enlargement of the prostate gland, occurs mostly in men over 50. Men of that age have a 25% to 30% chance of requiring a prostatectomy (removal of the prostate) at some time in their lives. The cause of BPH is still unknown, but the amounts of testosterone and other testicular steroids in the blood are thought to be contributing factors. The onset of BPH is slow. As the prostate increases in size, urethral compression causes the signs and symptoms of urinary tract obstruction—decreased force of the urine stream, increased frequency and urgency of urination, and nocturia. Over time, the obstruction worsens and the bladder cannot be fully emptied upon urination. This leads to incontinence or urine retention. Urine retention can cause elevated pressure in the kidneys (hydronephrosis), which presents a threat of renal failure.

BPH is diagnosed from these signs and symptoms, palpation, and laboratory analysis. Upon palpation, the prostate is found to be enlarged and to have lost its distinctive lobular shape. In up to 50% of patients, blood samples show an elevated level of prostate-specific antigen (PSA). Since the hyperplasia is not reversible, the only treatment in severe cases is surgical removal of the hyperplastic tissue or the entire prostate. In mild cases, treatment with androgen antagonists (such as Proscar) can reduce prostate size somewhat. Drugs that block α-adrenergic receptors and relax smooth muscle, such as prozosin and terazosin, have also been successful.

**Prostate Cancer**
Prostate cancer is responsible for almost 7% of all cancer deaths and is second only to lung cancer in cancer-related deaths in men in the United States. Although it accounts for 42% of all cancers in men, over 80% of all cases are seen in men aged 65 and over, and it rarely occurs before age 40. Diet and family history appear to influence the risk of developing prostate cancer. Androgens are not thought to cause prostate cancer, but they may promote tumor growth once the cancer has begun.

Most cases progress slowly and are asymptomatic at first, making early detection difficult. The initial signs and symptoms are those of urinary tract obstruction. Prostate cancer metastasizes to such sites as the pelvis, ribs, femur, vertebrae, lymph nodes, lungs, liver, and adrenal glands. Metastatic prostate cancer often produces bone pain and pathological fractures. Other signs include edema, hepatomegaly, and lymph node enlargement. Diagnosis is through DRE, blood screening for PSA, transrectal sonography, and biopsy. Sites of suspected metastasis are examined by MRI, CT, and biopsies.
Treatment depends on such factors as the stage of the cancer, anticipated side effects, and the patient’s age, health, and life expectancy. Older men who are already in poor health may opt not to pursue treatment, and men concerned about side effects such as erectile dysfunction may also forgo treatment. Treatment includes hormonal, chemical, or radiation therapy, prostatectomy, or a combination. Side effects include incontinence and erectile dysfunction.

The average 5-year survival rate for treated prostate cancer is 78%; in cases without metastasis, it rises to 95%. Because early detection is a key to successful treatment, annual DRE and PSA screening are recommended for men over 50; only DRE is recommended for those between the ages of 40 and 50. However, men with a family history of prostate cancer are encouraged to start screening earlier, sometimes even in their 20s.

Case Study 27 The Athlete Who Ignored His Symptoms

Erik is a 21-year-old minor league hockey player hoping for a spot in the National Hockey League (NHL). In one game, Erik is involved in a fight and is struck in the groin by an opponent’s stick. He falls to the ice in extreme pain and is taken to the hospital. In the emergency room, he is diagnosed with testicular torsion and a developing hydrocele. The physician relieves the torsion and aspirates a clear fluid from the hydrocele. Erik is told to visit his regular physician for further treatment if the swelling returns. He returns to play after a few days and finishes the season without incident. The following year, Erik is drafted by an NHL team.

Three years later, Erik develops difficulty breathing and a chronic cough that occasionally produces bloody sputum. Fearful that he could lose his place on the team, Erik downplays these symptoms when questioned by the team physician. But as the season progresses, the cough worsens and Erik begins to experience frequent headaches, dizziness, and blurred vision.

The team physician examines Erik and finds that he has lymphadenopathy in addition to his other symptoms. When questioned further, Erik mentions that he is becoming fatigued more easily and has been experiencing some abdominal pain.

During the physical examination, the team physician notes that Erik has a mass in the right testicle, but none in the scrotum. He asks Erik if the testicle had been giving him any trouble. Erik says that he’s noticed it seemed somewhat enlarged, but he thought this was just because of the injury he received back in the minor leagues. Suspecting a testicular tumor, the doctor orders blood tests and a CT scan. The blood analysis shows elevated concentrations of lactate dehydrogenase and α-fetoprotein. The CT scan reveals seven lung tumors and a brain tumor. Erik is referred to an oncologist and diagnosed with metastatic testicular cancer. Erik’s oncologist tells him that in cases this advanced, the chance of survival is about 50%. Erik is determined to beat the cancer, however, and agrees to an aggressive course of treatment.

He then undergoes orchiectomy and brain surgery to remove the primary testicular tumor and the metastatic brain tumor. He undergoes a successful year-long course of chemotherapy for the lung tumors. After remaining cancer-free for 2 years, Erik is told that if he remains so for one more year, he will be considered cured.

Based on this case study and other information in this chapter, answer the following questions.

1. If Erik’s testicular torsion were to go untreated, what would happen to the testis?
2. Why is the swelling in his testis diagnosed as a hydrocele rather than a spermatocele or a varicocele?
3. Why does Erik’s cancer go undiagnosed long enough to metastasize so widely?
4. Considering his occupation, what might happen to Erik if the cancer metastasizes to his bones?
5. Why do you think Erik’s brain tumor is treated surgically, instead of being treated with chemotherapy like the lung tumors?
6. Angelo, a 55-year-old male, is diagnosed with cirrhosis of the liver. Which of the following disorders might he develop as a secondary effect? a. prostatitis b. testicular cancer c. spermatocele d. hydrocele e. gynecomastia
7. Terry is diagnosed at the age of 14 with an ectopic testis located in the groin. The family physician recommends orchiectomy rather than surgically relocating the testis to the scrotum. His parents, who would like to be grandparents one day, protest and ask if it wouldn’t be better just to relocate the testis. How would you expect the doctor to advise them?

8. Why should men begin regular testicular self-examination (TSE) at an earlier age than they start receiving digital rectal examinations (DREs)?

9. Predict what a man might feel if he had epididymitis and did a TSE.

10. In what way does varicocele resemble varicose veins? (See chapter 20 of this manual.)

**Selected Clinical Terms**

- **benign prostatic hyperplasia (BPH)**  Noncancerous growth of the prostate gland, leading to urethral compression and impeded urine flow.
- **cryptorchidism**  The failure of one or both testes to completely descend through the inguinal canal into the scrotum.
- **digital rectal examination (DRE)**  Palpation of the prostate and neighboring structures by means of a gloved finger inserted into the rectum.
- **ectopic testis**  The descent of a testis to an abnormal location such as the perineal, suprapubic, or femoral region.
- **gynecomastia**  Abnormal enlargement of the male breasts.
- **hydrocele**  An accumulation of serous fluid in the tunica vaginalis of the scrotum.
- **orchiectomy**  Surgical removal of a testis.
- **orchiopexy**  Surgical translocation of a testis to its normal location in the scrotum.
- **phimosis**  The presence of a tight, nonretractable foreskin; a risk factor for penile cancer.
- **prostate-specific antigen (PSA)**  An antigen secreted by the prostate gland into the semen; elevated levels in the blood serum indicate prostatic enlargement and may be an early warning of prostate cancer.
- **prostatitis**  Inflammation of the prostate gland.
- **spermatocele**  A sperm-containing cyst in the epididymis.
- **testicular torsion**  Twisting of a testis on the spermatic cord, causing severe pain and testicular ischemia.
- **varicocele**  Abnormal dilation of veins in the spermatic cord due to failure of the venous valves to prevent backflow of blood.