Erectile Dysfunction (ED)

2.0 Contact Hours

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Objectives:

At the completion of this course, the learner will be able to:

1. Recognize the anatomy and physiology involved in penile erection.
2. Identify the etiology of ED.
3. Identify diagnostic procedures for ED.
4. Specify treatment for ED.

Epidemiology

Erectile dysfunction is a form of impotence in which there is a failure to achieve or maintain an erection adequate for sexual penetration. The incidence increases as a man ages with estimates of 5% occurrence after age 40, 10 to 25% after age 65, and 40 to 70% after age 70. Estimates vary since many men did not acknowledge ED to their physicians in the past, but accepted the problem as an inevitable sign of aging. More men are seeking assistance from their doctors for this condition, largely as a result of a more relaxed social acceptance of discussion about the disease. Since the advent of television advertising of Viagra, doctor visits have greatly increased since men are encouraged that they are not the only person with the disease and that there is a remedy for this problem. As this occurs, the rate of occurrence can be documented and statistics will continue to become more accurate.

Anatomy and Physiology

The penis consists of three chambers. The urethra is in the center of the corpus spongiosum on the underside or ventral side of the penis. This chamber functions to keep the urethra open during ejaculation. The other two chambers are called the corpora cavernosa on the left and right sides of the penile cavity. Within these two chambers are smooth muscles, fiber, lacunar spaces, arteries, veins, and a network of arterioles and venous plexuses. The corpora cavernosa are each covered by a membrane called the tunica albuginea. On the superior or dorsal side of the penis are the superficial dorsal veins which lie just under the skin surface. Sympathetic and parasympathetic nerves combine to become the cavernous nerves. They function to regulate the blood supply to the penis. Penile sensation and signals to the bulbocavernosus and ischiocavernosus muscles are supplied by the pudendal nerve.

As a result of mental or sensory stimulation, nitric oxide and other neurotransmitters and relaxing factors are released, the smooth muscles relax, allowing seven times the normal blood flow into the penis, and engorgement and erection occurs. As the chambers fill with blood and pressure builds, the veins are compressed against the tunica albuginea

membrane and occluded by the bulbocavernosus reflex which causes the ischiocavernosus muscles to contract. Blood then remains in the chambers until the flow of neurotransmitters stop. Phosphodiesterases break down the secondary messengers of the neurotransmitters, the ischiocavernosus muscles relax, and blood flows out of the penis during detumescence.

Etiology

Erectile dysfunction implies a problem with one of three mechanisms:

- There is a failure to initiate tumescence.
- There is a failure to adequately fill the corpora cavernosa to achieve erection.
- There is a failure of veno-occlusion that prevents blood from leaving the corpora cavernosa so that an erection is maintained.

Most patients have a combination of factors that affect these mechanisms; there is rarely a sole cause for ED.

When failure to initiate is the problem, psychogenic, endocrinologic, or neurogenic factors are the cause. Psychogenic factors are present in 10 to 20% of cases and gradually develop in almost all men who have ED from other causes. There is a loss of libido and an impaired release of nitric oxide. These factors include anxiety, anger, guilt, depression, stress, low self-esteem, sexual inhibition, relationship problems, conflicts over sexual preferences, sexual abuse, fear of pregnancy, or fear of acquiring a sexually transmitted disease. Schizophrenia has also been implicated. Endocrinologic factors include hypogonadism (decreased testosterone) and hyperprolactinemia (prolactin inhibits hormonal secretions and an inadequate release of nitric oxide occurs). Renal and hepatic diseases also interfere with hormonal control of erections. Neurogenic factors interfere with libido and nerve impulses that initiate erection. These factors include multiple sclerosis, Alzheimer's disease, Parkinson's disease, stroke, cerebral trauma, lower spinal cord trauma, and diabetes mellitus. Injuries to the penis or pelvis, radical prostate surgery, and bladder surgery can all damage nerves supplying the penis. Nerve-sparing procedures reduce the risk of ED with erections returning after a period of 6 to 18 months of healing for some men.

Failure to adequately fill the corpora cavernosa is a result of vasculogenic factors. These factors cause a narrowing of arterial blood vessels which reduces the flow of blood into the penis. Factors include arteriosclerotic vascular disease, hypertension, hyperlipidemia, diabetes mellitus, cigarette smoking, and trauma to the penile artery causing stenosis. Drugs can also interfere with blood flow as can irradiation of the pelvic structures.

Veno-occlusive factors interfere with the pressure within the penis that compresses veins and keeps blood in the corpora cavernosa during erection. These factors include a rupture of the tunica albuginea, trauma to the cavernous muscles or epithelium, diabetes mellitus, and Peyronie's disease. Peyronie's disease is caused by trauma to the penis

resulting in scarring of the tissues that may cause an abnormal bend that interferes with blood flow. This trauma occurs during intercourse and is not felt by the majority of men.

In addition to the above, other diseases and conditions can interfere with erections. Chronic renal failure, benign prostatic hypertrophy, cardiovascular heart disease, obesity, and lack of exercise are all implicated in ED.

The aging factor is disputed with some experts claiming that ED is not an inevitable part of aging and others maintaining that aging can at least contribute to ED. With age, a lower serum testosterone level and several changes in sexual functioning have been noted. They include a delay in provoking an erection via stimulation, a less rigid erection, less ejaculate, less force during ejaculation, and a longer refractory period between ejaculations.

There are many drugs that interfere with one or more of the mechanisms necessary to achieve and maintain erections. Recreational drugs such as alcohol, heroin, cocaine, and marijuana contribute to ED. Other drugs known to cause ED include antipsychotics, antihypertensives, tranquilizers, sedatives, antidepressants, beta-adrenergic blockers, thiazide diuretics, histamine-H2 receptor antagonists, estrogens, cardiac medications, anti-hyperlipidemics, anticholinergics, and cytotoxic agents. Over-the-counter medications can also cause ED.

Effects

ED affects the patient and their partner(s). Relationships may become strained and tense. The patient feels hopeless about the condition and self-identification and self-esteem suffers. There is an endless cycle of failures that feeds upon and worsens ED. The patient feels inadequate, embarrassed, and guilty and feels less attractive to partners. Socialization and job performance may be affected by ED. Men may isolate themselves and avoid intimate relationships. This picture changes depending on the degree of open, honest communication between partners that acknowledges the problem and seeks a solution.

Diagnosis

A good patient/healthcare provider relationship encourages a patient to bring the problem of ED to medical attention. Healthcare providers can screen all male patients about sexual concerns at routine office visits. Once the concern about ED is raised, diagnostic efforts to seek a cause can begin.

A thorough medical and surgical history is obtained. Current medications, allergies, and any other symptoms of illness are recorded. A psychosocial history includes the status of relationships, stresses, death, divorce, or other concerns the patient may have. A sexual history is taken with attention to the onset, progression, and duration of symptoms of ED.

The patient is asked about the presence of nocturnal or early morning erections, libido, ejaculations, penile curvature during erections, or pain during intercourse. A tool that can be used to determine symptoms of ED is the Sexual Health Inventory for Men (SHIM). It is important to know if ED occurs with all sexual partners if there is more than one. The presence of nocturnal erections during rapid eye movement (REM) sleep means that the cause is psychogenic since intact neurological and circulatory systems are obviously present. When the cause is organic the patient complains of gradual, persistent changes in the amount of rigidity or the ability to sustain erections and a lack of nocturnal and early morning erections.

During the physical exam a focus will be on looking for many diseases in which the presenting symptom is ED. It has been associated in this way with cardiovascular conditions, arteriosclerotic disease, diabetes, coronary artery disease, hypertension, hyperlipidemia, spinal-cord compression, and pituitary tumors. During examination the breasts, hair distribution, penis, and testis are assessed. A prostate exam is done and anal sphincter tone is noted. Perineal and genital sensation is tested. Radial, femoral, and pedal pulses are evaluated.

Labwork includes:

- Urinalysis
- Electrolytes
- Complete blood count (CBC)
- Fasting blood glucose
- Lipid profile
- Liver enzymes
- Creatinine
- Prostate specific antigen (PSA)
- Testosterone: If low other tests may be performed including serum free testosterone, prolactin and lutenizing hormone levels.

After the histories, examination, and labwork are done the cause may be revealed. If not, further costly and invasive testing can be done:

- Monitoring of nocturnal penile tumescence
- Penile injection of a vasoactive substance
- Penile Doppler ultrasound
- Penile angiography
- Dynamic infusion cavernosography/cavernosometry
- Neurological testing
- Psychological diagnostic tests

Treatment

Treatment of ED can be accomplished at any age. When the examinations and testing is completed the healthcare provider discusses the results with the patient, asks the patient what his goals for treatment are, and reviews treatment options given the health and co-morbid diseases of the patient. Treatment progresses from least to most invasive options.

Patients are counseled on modifying risk factors such as ingestion of alcohol or recreational drugs, lack of exercise, obesity, and smoking. Co-morbid diseases are treated. If a medication is an obvious cause, another may be substituted.
All patients can benefit from psychotherapy sessions to decrease the anxiety associated with ED and to address other psychosocial distress the patient may have. Both patient and partner can attend behavior modification discussions and practice techniques at home that help to develop and enhance intimacy and sexual stimulation.

Medications are often the first option for treatment. Oral phosphodiesterase type-5 (PDE-5) inhibitors halt the breakdown of the secondary messengers of nitric oxide, allowing smooth muscle to relax and increasing blood flow into the penis. Sildenafil citrate (Viagra) was the first of this type of medication. Vardenafil hydrochloride (Levitra) and tadalafil (Cialis) are also available. These medications are contraindicated for patients who take alpha-blockers or any form of nitrate therapy or who recreationally use amyl or butyl nitrate poppers due to the combined effect of profound hypotension. Patients with significant cardiovascular disease should not use PDE-5 inhibitors either. Side effects include headache, facial flushing, stomach upset, and nasal congestion. These drugs may be used only once daily, taken 1 to 2 hours prior to sexual activity. They all tend to have the same basic effect. The half-life of tadalafil is the longest.

Testosterone may be administered orally, transdermally, or intravenously if levels are low. This therapy is rarely effective and can damage the liver. The PSA must be drawn to help rule out prostate cancer prior to administration. A nitroglycerin cream may be applied to the penis to enhance blood flow. Other drugs for ED that are unproven via clinical studies include yohimbine hydrochloride, dopamine, serotonin agonists, and trazodone. The U.S. Food and Drug Administration (FDA) warns against over-the-counter or Internet supplements that are supposed to help ED. Many of these supplements contain illegal traces of PDE-5 inhibitors that can cause serious side effects if taken by a man who also takes nitrates or alpha-blockers.

Intercavernosal injections of papaverine hydrochloride, phentolamine, or alprostadil may help to achieve a more robust erection by dilating the blood vessels if oral medication is inadequate. Side effects include penile pain, painful and prolonged erections (priapism), and fibrotic scarring from chronic use.

Intraurethral injections involve using a prefilled applicator to insert a pellet containing alprostadil one inch into the urethral opening. This method produces an erection within 10 minutes lasting 30 to 60 minutes. Side effects include penile and testicular pain, warmth and burning of the urethra, erythema of the penis, and minor urethral bleeding.

Vacuum devices exist that draw blood into the penis to achieve an erection that has a nonphysiological appearance and feel. A plastic cylinder is placed over the penis and a pump provides the vacuum. An elastic band is then placed around the base of the penis to prevent blood escaping the corpora cavernosa. Pain, ecchymosis, numbness, and alteration in ejaculation may occur with this method.

Surgery is the last option. Penile prostheses consisting of rods or inflatable implants with a scrotal pump have a high rate of approval from patients and partners. Surgery to reconstruct arteries may be performed on young men who have sustained penile injuries. Surgery to occlude veins is rarely performed.

Nursing Implications

Nurses can provide information and promote dialog about erectile dysfunction. They can provide an understanding, non-judgmental emotional outlet for patients or partners. Patients should be educated about contraindications, proper use, and side effects of ED medications and other treatments. Interventions to provide education and nursing care before and after surgery for ED will assist the patient and partner to achieve mental and physical healing that promote improved sexual functioning and enhanced relationships for the patient with ED.

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