Erectile Dysfunction (ED)

Erectile dysfunction (ED) is a medical term that describes the inability to achieve and or maintain an erect penis adequate for sexual function. This condition is one of the most common sexual problems for men and the number of men suffering from ED increases with age. Approximately 25 million American men suffer from ED, although not all men are equally distressed by the problem.

Anatomy and Function

The internal structure of the penis includes two cylinder-shaped chambers, the corpora cavernosa. Filled with spongy tissue containing smooth muscles, fibrous tissue, veins and arteries, these chambers run the length of the organ and are surrounded by a membrane cover, called the tunica albuginea. The urethra, the channel through which urine and semen exit the body, is located on the underside of the corpora cavernosa and is surrounded by spongy tissue. The longest part of the penis is the shaft, which ends in the glans. The meatus is the opening at the end of the urethra.

Erection is the culmination of a complex set of physical, sensory and mental events, involving both the nervous and vascular systems. It begins when physical or psychological stimulation (arousal) causes neurotransmitters or impulses in the brain (chemicals such as dopamine, acetylcholine and nitric oxide) to tell the muscles of the corpora cavernosa to relax, allowing blood to fill the organ's tiny open spaces. As the tunica's fibrous or elastic tissues trap the blood, the penis engorges, or increases, in an erection. When stimulation finally ends, usually after ejaculation, pressure inside the organ decreases, as the muscles contract. Blood then flows from the penis and the penis returns to its normal shape and size.

Causes and Risks

By far, the most important cause of the development of ED is the presence of illnesses like high blood pressure, diabetes mellitus, high cholesterol levels and cardiovascular disease. These processes, acting over time, can lead to a degeneration of the penile blood vessels, leading to restriction of blood inflow through the arteries and also to leakage of blood through the veins during erection.

The choices we make in life can lead to degeneration of the erectile tissue and the development of ED. Smoking, drug or alcohol abuse, particularly over a long period of time, will compromise the blood vessels of the penis. Lack of exercise and a sedentary lifestyle will contribute to the development of ED. Correction of these conditions will contribute to overall health and may in some individuals correct mild ED. Treatment of many medical conditions can interfere with normal erections. Drugs used to treat these risk factors listed above may also lead to or worsen ED. Patients undergoing surgery or radiation therapy for cancer of the prostate, bladder, colon or rectum are at high risk for the development of ED.

Diagnosis

For most patients, the diagnosis will require a simple medical history, physical examination and a few routine blood tests. Most patients do not require extensive testing before beginning treatment. The choice of testing and treatment depends on the goals of the individual. If erection returns with simple treatment like oral medication and the patient is satisfied, no further diagnosis and treatment are necessary. If the initial treatment response is inadequate or the patient is not satisfied, then further steps may be taken. In general, as more invasive treatment options are chosen, testing may be more complex.

Treatment

NON-SURGICAL TREATMENT

Phosphodiesterase-5 Inhibitors (PDE-5): The first line of therapy for uncomplicated ED is use of oral medications known as phosphodiesterase-5 inhibitors (PDE-5) which includes sildenafil citrate, vardenafil and tadalafil. Men with ED take these pills before beginning sexual activity and the drugs boost the natural signals that are generated during sex, thereby improving and prolonging the erection itself. These medications are safe and fairly effective, with improvement in erection in nearly 80 percent of patients using these drugs. Early concerns about possible bad effects on the heart have not proven true; after extensive testing and five years of use, sildenafil citrate can be used safely by all heart patients except those using medications called nitrates because of an interaction between these two classes of drugs. The side effects of PDE-5 inhibitors are mild and usually transient, decreasing in intensity with continued use. The most common side effects are headache, stuffy nose, flushing and muscle aches. In rare cases, sildenafil can cause blue-green shading of vision due to high blood levels of sildenafil exerting a brief effect on the retina of the eye. This is of no long-term risk and is gone within a short time as the amount of sildenafil in the blood decreases. It is important to follow the instructions for using these medications in order to get the best results. Tests have shown that 40 percent of men who do not respond to sildenafil will respond when they receive proper instruction on medication use.

Alprostadil: For men who do not respond to oral medications another drug, alprostadil, is approved for use in men with ED. This drug comes in two forms: injections that the patient places directly into the side of the penis and a transurethral suppository. Success rates with self-injection can reach 85 percent. Modifying alprostadil to allow transurethral delivery avoids the need for a shot, but reduces the effectiveness of the agent to 40 percent. The most common adverse effects of alprostadil use are a burning sensation in the penis and the risk of over correcting the problem, resulting in a prolonged erection lasting over four hours and requiring medical intervention to reverse the erection.

External Vacuum Device: For men who cannot or do not wish to use drug therapy, an external vacuum device may be acceptable. This device combines a plastic cylinder or

tube that slips over the penis, making a seal with the skin of the body. A pump on the opposite end of the cylinder creates a low-pressure vacuum around the erectile tissue, which results in an erection. To keep the erection once the plastic cylinder is removed a rubber constriction band goes around the base of the penis, which maintains the erection. With proper instruction 75 percent of men can achieve a functional erection using a vacuum erection device.

There are some men who have severe degeneration in the tissues of the penis, which makes them unable to respond to any of the treatments listed above. While this is a small number of men, they usually have the most severe forms of ED. Patients most likely to fall into this group are men with advanced diabetes, men who suffered from ED before undergoing surgical or radiation treatment for prostate or bladder cancer and men with deformities of the penis called Peyronie's disease. For these patients reconstructive prosthetic surgery (placement of a penile prosthesis or "implant") will restore erection, with patient satisfaction rates approaching 90 percent. Surgical prosthetic placement normally can be performed in an outpatient setting or with one night of hospital observation. Possible adverse effects include infection of the prosthesis or mechanical failure of the device.

SURGICAL TREATMENT

Penile Prostheses: Penile prostheses are devices that are implanted completely within the body. They produce an erection-like state that enables the man who has one of these implants to have normal sexual intercourse. Neither the operation to implant a prosthesis nor the device itself will interfere with sensation, orgasm or ejaculation.

There are two erection chambers (corpora cavernosa) in the penis. All penile prostheses have a pair of components that are implanted within both of these erection chambers. The simplest penile prostheses consist simply of paired flexible rods that are usually made of medical-grade silicone, and produce a degree of permanent penile rigidity that enables the man to have sexual intercourse. These devices are either malleable or inflatable. A malleable rod prosthesis can be bent downward for urination or upward for intercourse. Inflatable penile prostheses are fluid-filled devices that can be inflated for erection. They are the most natural feeling of the penile implants, as they allow for control of rigidity and size.

The inflatable devices have fluid-filled cylinders that are implanted within the erection chambers. Tubing connects these cylinders to a pump that is implanted inside the scrotum, the sac that contains the testicles. In the simplest of these inflatable devices, the pump transfers a small amount of fluid into the cylinders for erection, which then transfers out of the cylinders when erection is no longer needed. These devices are often referred to as two-component penile prostheses. One component is the paired cylinders and the second component is the scrotal pump.

Three-component inflatable penile prostheses have paired cylinders, a scrotal pump and an abdominal fluid reservoir. With these three-component devices, a larger volume

of fluid is pumped into the cylinders for erection and out of the cylinders when erection is no longer needed.

Penile prostheses are usually implanted under anesthesia. Usually one small surgical cut is made either above the penis where it joins the abdomen or under the penis where it joins the scrotum. No tissue is removed, blood loss is small and blood transfusion is almost never required. A patient will typically spend one night in the hospital.

Most men have pain after penile prosthesis implantation for about four weeks. Initially, oral narcotic pain medication is required and driving is prohibited. If men limit their physical activity while pain is present, it usually resolves sooner. Men can often be instructed in using the prosthesis for sexual activity one month after surgery, but if pain and tenderness are still present, this is sometimes delayed for another month.

Following prosthesis implantation infection occurs in 1 to 5 percent of cases. This is a significant complication because in order to eliminate the infection, it is almost always necessary to remove the prosthesis. In 1 to 3 percent of cases, erosion occurs when some part of the prosthesis protrudes outside the body. Erosion often is associated with infection and removal of the device is frequently necessary.

Mechanical failure is more likely to occur with inflatable than with rod prostheses. The fluid present inside the prosthesis leaks into the body; however, these prostheses contain normal saline that is absorbed without harm. After mechanical failure, another operation for prosthesis replacement or repair is necessary if the man wants to remain sexually active. Today's three-component inflatable penile prostheses have about a 10 to 15 percent likelihood of failure in the first five years following their implantation.

Penile Arterial Revascularization: This procedure is designed to keep blood flowing by rerouting it around a blocked or injured vessel. Indicated only for young men (under 45) with no known risk factors for atherosclerosis, this procedure is aimed at correcting any vessel injury at the base of the penis caused by adverse events such as blunt trauma or pelvic facture. When such an event leaves a penile vessel too injured or blocked to transfer blood, the surgeon may microscopically connect a nearby artery to get around the site, clearing the pathway so enough blood can be supplied to the penis to enable an erection.

Venous Ligation Surgery: This procedure focuses on binding leaky penile vessels that are causing penile rigidity to diminish during erection. Because venal occlusion, necessary for sufficient firmness, depends on arterial blood flow and relaxation of the spongy tissue in the penis, this approach is designed to intentionally block off problematic veins so that there is enough blood trapped in the penis to create an appropriate erection. Since long-term success rates are less than 50 percent, this technique is rarely a choice for correcting ED.