The American Urological Association
Erectile Dysfunction Clinical Guidelines Panel

The Treatment of Organic Erectile Dysfunction

A Patient's Guide

Erectile Dysfunction Clinical Guidelines Panel

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What is erectile dysfunction?

Erectile dysfunction is the inability to achieve or maintain a hard, erect penis sufficient for sexual intercourse. Traditionally, this inability has been called “impotence.” The term “erectile dysfunction” is more precise, because it refers only to erection problems. Men with erection problems often retain other sexual functions. For example, they may still have sexual desire and may still be able to have orgasms and ejaculate semen.

Penile anatomy

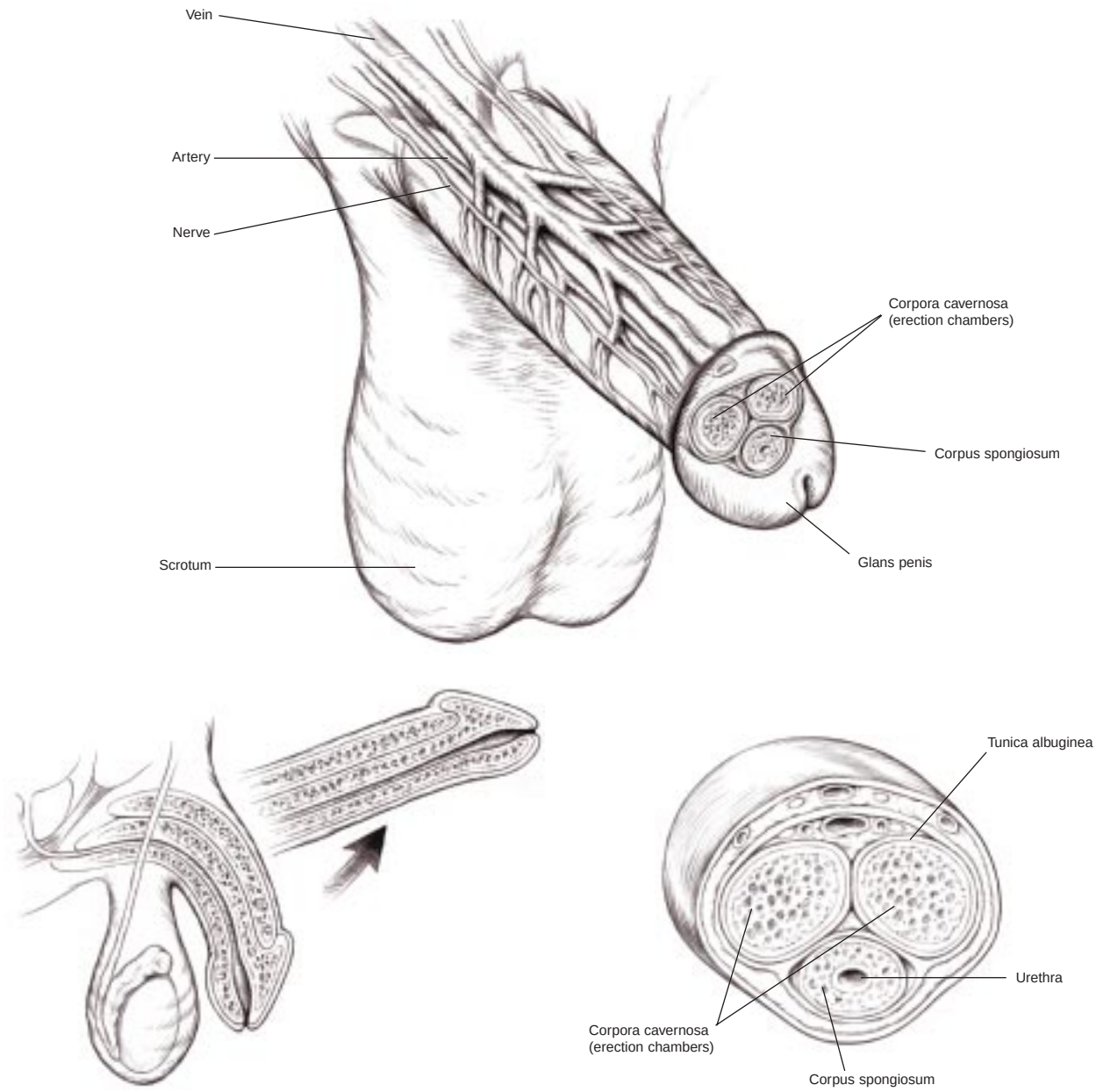

Figure 1. Penile erection process.

How is a penile erection achieved?

A natural erection is the result of a complex process. Figure 1 on the previous page shows the parts of the penis involved in the process. However, the control center is the brain. The brain, for example, is where sensations of sexual arousal are experienced. These sensations may involve psychological factors such as erotic fantasies or expectations that arouse sexual desire. Sensory factors, such as a scent, a tone of voice or the sight of a sexual partner undressing, are often involved.

The brain sends its arousal signals to the penile nerves. Penile nerves are also stimulated by direct sensory contact, such as by manual stroking of the genitalia and by the act of sexual intercourse itself.

The nerve impulses go to two "erection chambers," the corpora cavernosa. There the nerve impulses cause relaxation of penile tissue and expanding of arterial blood vessels. The corpora cavernosa, as shown in Figure 1, are two cylinders side-by-side in the penis. Covering them is a dense, elastic, fibrous envelope called the tunica albuginea.

As penile tissue relaxes and penile arteries expand, the blood flow into the erection chambers increases. The penis then swells in size. Veins that drain the blood are compressed against the inner wall of the tunica albuginea. The blood is thus trapped, making the penis hard and erect. Continued stimulation keeps the process going and maintains the erection.

What causes erectile dysfunction?

In a process as complex as penile erection, problems can occur for many reasons. Very often an erectile problem will have more than one cause. The causes may be psychological or physical or a combination of both. Distinguishing between psychological and physical causes is helpful, because treatments may differ depending on the cause. This *Patient's Guide* focuses on treating erectile problems that have mainly physical causes.

Psychological causes of erectile dysfunction include stress and anxiety due to marital, financial or other external problems. For example, a sexually active man may suddenly find himself unable to have an erection shortly after losing his job. It is possible for the man's stress and anxiety to interfere with nerve impulses from his brain when he attempts sexual intercourse. "Performance anxiety" is also a common cause of erectile dysfunction. Because of anxiety about his ability to "perform," a man finds he cannot perform—which causes more anxiety, thus completing a vicious cycle. Psychiatric illnesses such as depression can also cause erectile dysfunction.

The most frequent **physical causes** of erectile dysfunction are vascular (blood vessel) diseases. Vascular diseases may cause problems involving blood flow into the penis to make it erect. They can also cause problems of holding the blood in the penis to maintain the erection. Thus, hardening of the arteries and other diseases that affect the vascular system are risk factors for erectile dysfunction.

Diseases that affect the nervous system, such as multiple sclerosis and alcoholism, can also cause erectile dysfunction. Some diseases associated with erectile dysfunction can affect both the vascular and the nervous systems. Diabetes is an example.

As pointed out previously, erectile dysfunction often has multiple causes. A man with diabetes, for instance, may be a heavy smoker and a heavy drinker. He may have high blood pressure and a high level of blood cholesterol. Each of these conditions can damage the vascular system and/or nervous system. Each is a risk factor for erectile dysfunction. When any of these conditions occur together, the risk increases.

Erectile dysfunction can result from pelvic fractures or crush injuries experienced in an automobile, motorcycle or other accident. The accident victim may be left with injured nerves and/or penile arteries that cannot supply enough extra blood to the penis for an erection. Spinal cord injuries that destroy nerve fibers are another cause of erectile dysfunction. Some types of surgery and radiation therapy, such as for treating prostate, bladder or rectal cancer, carry a risk of erectile dysfunction. In addition, certain medications might contribute to erectile dysfunction. The patient should review with his doctor all medications taken recently.

The effect of low levels of the male sex hormone testosterone on erectile function is not clear. Studies have shown that low testosterone levels do not necessarily prevent a man from having an erection. Low testosterone levels, however, can decrease sexual desire.

The effects of aging on erectile function have also been studied. Although the rate of erectile dysfunction in the male population increases with age, aging itself does not appear to be the cause. The causes are illnesses, such as vascular diseases and diabetes, that may develop as a man ages, with possible contributing effects from medications taken to treat such illnesses. There may be contributing effects as well from years of smoking or alcohol abuse.

How are causes of erectile dysfunction diagnosed?

Finding the causes of erectile dysfunction usually begins with a patient's **medical and sexual history**. The doctor interviews the patient for possible risk factors. Some doctors also use a printed questionnaire.

For the **medical history**, the patient will be asked questions covering a wide range of risk factors. Included will be questions about illnesses such as diabetes, heart disease and high blood pressure. Questions will be asked about any surgery, radiation exposure or accidental injuries and about smoking habits and alcohol intake. The patient will also be asked about medications he has taken in the past year.

For the **sexual history**, typical questions are: "When was the last time you had a normal erection?" "Do you ever wake up in the morning with an erection?" "When was the last time you had sexual intercourse?" The patient may be asked (1) whether his erections are painful or (2) if his penis is severely bent when erect. A "yes" to either question could indicate Peyronie's disease, a condition caused by scar tissue in the penis. Additional questions may be asked to find out if there could be psychological reasons for the patient's erectile problems. In some cases, the doctor may refer the patient to a specialist for a more extensive psychological examination.

The next step after the medical and sexual history is a **physical examination**. The doctor will pay particular attention to the genitalia and will test nervous and vascular function as well as check for Peyronie's disease. The doctor may do a rectal examination to check the condition of the prostate.

Samples of the patient's blood and urine may be tested in a laboratory. **Lab tests** include measuring testosterone levels and testing for diabetes and vascular problems such as elevated cholesterol or fat in the blood. If necessary, additional **special tests** may be conducted. An example is using high-frequency sound waves (ultrasound) to check the condition of penile arteries. Another example is observing the response to drugs that normally stimulate an erection when injected into the penis.

Still another kind of special test measures "nocturnal penile tumescence and rigidity" (NPTR). For the NPTR test, the patient attaches a pair of special gauges to his penis before going to sleep. Normally, men of all ages have erections during the dreaming (rapid eye movement) stages of their sleep. The NPTR test measures these erections. If no nocturnal erection occurs or if the erection is impaired, the cause of the erectile dysfunction is likely to be physical. By contrast, a normal NPTR in a man with erectile dysfunction suggests a psychological cause.

What are the choices for treating erectile dysfunction?

Treatment of erectile dysfunction depends first on whether the causes are mainly psychological or physical. As an example, if a young patient has normal erections during sleep, if his physical examination and lab tests do not indicate a problem and if he is generally in good health—the cause is likely to be psychological. In such a case, the most effective treatment may be sexual counseling with a psychologist who specializes in sex therapy. The therapist may recommend that the patient's sexual partner be included in counseling sessions.

For erectile dysfunction with mainly physical causes, the treatment may depend on the particular problem. For example, in some men with erectile dysfunction due to pelvic injuries, surgery may be recommended. For some men with very low testosterone levels, testosterone replacement therapy may be recommended.

For the majority of men whose erectile dysfunction has mainly physical causes, there are three generally accepted treatment options: vacuum constriction devices, penile injection therapy and penile prostheses. They are illustrated in Figures 2, 3 and 4. These treatments cannot correct the causes of erectile dysfunction, but they can help a man achieve a rigid penis sufficient for sexual intercourse. They work in different ways.

Vacuum constriction devices (VCDs) consist of a plastic cylinder, a vacuum pump and an elastic constriction band. Figure 2 (opposite) shows how the VCD is used. There are five steps: (1) Lubricant is applied to the penis. (2) The cylinder is placed over the penis. (3) Air is pumped out of the cylinder to create a vacuum, which causes an erection. (4) The constriction band, mounted on the open end of the cylinder, is transferred to the base of the erect penis to maintain the erection. (5) The cylinder is removed. The constriction band can safely be left on the penis for a half hour.

It is important for safety to use only a prescription VCD in which all parts, including the pump and the elastic constriction band, are made by a reputable manufacturer.

In **penile injection therapy**, vasoactive drugs are injected into the erection chambers, the corpora cavernosa, as shown in Figure 3. These drugs work by expanding arteries and relaxing penile tissue. Blood flow then increases into the two erection chambers, helping to cause an erection. (See the description on page 2.)

One frequently used vasoactive drug is alprostadil, also known as *prostaglandin-E_1 (PGE_1)*. Vasoactive drugs are often used in combination. Some frequently used combinations are *papaverine/phentolamine, papaverine/phentolamine/PGE_1* and *PGE_1/phentolamine*.

The vacuum constriction device

Figure 2a. The constriction band is usually mounted on the open end of the cylinder.

Figure 2b. With the cylinder over the penis, air is pumped out to create a vacuum and cause an erection.

Figure 2c. The constriction band is pulled off the cylinder onto the base of the erect penis.

Figure 2d. The cylinder is removed.

The doctor may inject a vasoactive drug or combination of drugs as a diagnostic procedure to test how well the penis responds. If penile injection therapy is chosen as a treatment, the patient will be taught how to do the injections himself.

A **penile prosthesis** is a plastic device surgically implanted inside the penis so the penis can be made rigid. A prosthesis does not change the ability to urinate, ejaculate or have an orgasm.

There are two basic types of prostheses. The simpler type is a semirigid but malleable rod (Figure 4a). The other type is inflated with fluid to make the penis stiff. An inflatable prosthesis comes in three basic designs: one-piece, two-piece (Figures 4b and 4c) and three-piece (Figures 4d and 4e, page 6).

Figures 4d and 4e illustrate how a three-piece inflatable prosthesis works. For this type, the surgeon implants two paired cylinders, a reservoir and a pump. They are placed as shown in Figure 4d. Figure 4e shows the prosthesis inflated. The fluid has been pumped out of the reservoir into the cylinders to stiffen the penis. Pressing a valve at the base of the pump returns the fluid to the reservoir, deflating the cylinders.

Penile injection therapy

Figure 3. Injecting a vasoactive drug or combination of drugs into the penis.

Penile prostheses

Figure 4a. Penis with semirigid malleable prosthesis in relaxed position.

Figure 4b. Penis with one-piece inflatable prosthesis in erect position about to be deflated by applying pressure to the base of the penis.

Figure 4c. Penis with two-piece inflatable prosthesis being inflated to erect position. The pump and reservoir are in the scrotum.

Figure 4d. Penis with three-piece inflatable prosthesis in deflated position about to be inflated. The pump is in the scrotum. The reservoir is in the abdomen.

Figure 4e. Penis with three-piece inflatable prosthesis in inflated position.

What are the main advantages and disadvantages of each treatment?

Vacuum constriction devices, penile injection therapy and penile prostheses are all effective treatment options, each in its own way. Reported patient satisfaction averages over 70 percent for each treatment.

Yet, a satisfactory treatment for some patients may be unsatisfactory for others. As the descriptions and illustrations on pages 4 to 6 make clear, the three treatments are not alike in how they work. Each has its own set of advantages and disadvantages. In addition, each patient has his own preferences. On the basis of individual preferences, patients may weigh treatment advantages and disadvantages quite differently in making a choice.

Following are some of the major advantages and disadvantages to consider for each treatment choice.

Vacuum constriction devices

Vacuum constriction devices (VCDs) are reliable and safe, with no serious side effects when reputable prescription devices are used properly (after patient instruction by trained professionals). If a man wants to discontinue use of a VCD and try another treatment, he has that option. About three out of four men who begin using a VCD continue to use it. Most dropouts occur in the first three months. Interruption of lovemaking is the most common complaint by VCD users and their partners. Some men also report numbness or coldness of the penis and/or discomfort when ejaculating.

Penile injection therapy

Injection therapy tends to produce a firm erection, which may last an hour or more. A man can inject himself before sexual activity begins. Erection occurs five to 15 minutes after the injection.

With practice, the injection procedure is easy to do. It is usually painless, though some men report discomfort following injection. This discomfort is generally mild. As with VCD therapy, the patient has the option to discontinue treatment. Most dropouts take place in the first month or two.

Injection therapy may have complications or side effects. The most serious is a prolonged erection. This is an erection lasting more than four hours. If a prolonged erection lasts too long, the

penis can be injured. The doctor will provide information beforehand on how to seek treatment in case of a prolonged erection.

The chances of a prolonged erection with injection therapy range from one to eight percent, but it rarely occurs once a patient has had proper instruction and dosage adjustment. Other potential side effects with injection therapy include the possibility of scar tissue eventually forming in the penis.

Penile prostheses

For men surgically implanted with penile prostheses, patient satisfaction rates are high. They average over 83 percent for both semirigid malleable prostheses and inflatable prostheses. With a prosthesis in place, a man can create an erection whenever he wishes. The erection may be slightly shorter in length than a natural erection would be, but rigid enough for sexual intercourse. There is no change in skin sensation and no change in ability to have an orgasm.

Once a prosthesis is implanted, however, it is difficult for a patient to change his mind and choose a different treatment option. Removal of the prosthesis requires another operation.

Failure of the device is possible. Even though prostheses are constantly being improved and made more reliable, any mechanical device can fail. For an inflatable prosthesis like that shown in Figure 4d, the chances of mechanical failure are about one out of ten. For the simpler semirigid malleable prosthesis (Figure 4a), chances of mechanical failure are about one out of 20. Mechanical failures or other device problems usually require another operation to correct the problem.

Possible complications from surgery, such as infection, may also require removal of the prosthesis. Again, this means another operation.

Cost and time considerations in choosing a treatment

In addition to the advantages and disadvantages discussed above, cost and loss of time from work or other activities may be considerations in choosing a treatment. If cost is a consideration, vacuum constriction devices have a clear advantage. They are far less expensive than the operation necessary to implant a prosthesis, and less expensive over time than the drugs necessary for injection therapy.

As to patient time required, usually one training session is enough to learn to use a vacuum constriction device, in addition to follow-up as scheduled with the doctor.

For injection therapy, several visits to the doctor may be necessary in the first two months to learn self-injection, adjust the dosage and check for any complications.

Implanting a prosthesis usually means one to two days in the hospital, 10 to 21 days before resuming usual activities after surgery and one or two follow-up office visits.

Where to find more information

Sexual Function Health Council
American Foundation for Urologic Disease
1128 N. Charles Street
Baltimore, MD 21201
410-727-2908

Questions to ask the doctor before choosing a treatment

- ❑ What appears to be causing my erection problems?

- ❑ What treatment choices do I have based on the results of my diagnostic examination?

- ❑ What are the advantages and disadvantages of each treatment choice, including any that may not have been mentioned in this *Patient's Guide*?

- ❑ What are likely advantages and disadvantages of each treatment choice for my sexual partner? (To be discussed with sexual partner, if possible.)

- ❑ How much will each treatment cost? How much of that cost will be covered by insurance?

Additional questions to ask the doctor:

- ❑ _____

  _____

- ❑ _____

  _____

- ❑ _____

  _____

- ❑ _____

  _____

Glossary

Arteries: Blood vessels that carry blood from the heart to various parts of the body.

Cholesterol: A fat-like substance important to certain body functions but which, in excessive amounts, contributes to unhealthy fatty deposits in the arteries that may interfere with blood flow.

Corpora cavernosa: Two cylinder-shaped bodies that lie side by side in the penis and that, when filled with blood, enlarge to cause the penis to swell and become erect (erection chambers).

Genitalia: The external sexual organs.

Hardening of the arteries: Common descriptive expression referring to a group of diseases (forms of arteriosclerosis) characterized by abnormal thickening and hardening (sclerosis) of arterial walls, in which the walls lose their elasticity.

Orgasm: Sexual climax.

Semen: The thick whitish fluid, produced by glands of the male reproductive system, that carries the sperm (reproductive cells) through the penis during ejaculation.

Testosterone: Male hormone responsible for sexual desire and for regulating a number of body functions.

Tumescence: Swelling of the penis caused by increased blood flow into the corpora cavernosa.

Tunica albuginea: Dense, fibrous, elastic sheath enclosing the corpora cavernosa in the penis. Compression of small blood vessels against the tunica albuginea during erection holds back outflow of blood from the two corpora, causing the penis to be rigid.

Vascular: Having to do with blood vessels.

Vasoactive: Affecting the size (diameter) of blood vessels.

This publication is intended for patients and lay readers. It is derived from the *Report on the Treatment of Organic Erectile Dysfunction*, developed by the American Urological Association, Inc., and its Erectile Dysfunction Clinical Guidelines Panel.

The *Patient's Guide* is intended to be used by physicians to stimulate and facilitate discussion with the patient regarding the treatment modalities described in summary fashion in this booklet. The full *Report* of the guidelines panel provides the physician with a more detailed discussion of standards, guidelines and options to be considered.

For additional copies, physicians may contact:

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