

Review article

Erectile Dysfunction – Epidemiology, management and prevention.

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Abstract

Erectile dysfunction (ED) or male impotence is a sexual dysfunction characterized by the inability to develop or maintain an erection of the penis. Erectile dysfunction, tied closely as it is to cultural notions of potency, success and masculinity, can have devastating psychological consequences including feelings of shame, loss or inadequacy; often unnecessary since in most cases the matter can be helped. Until about 20 years ago erectile dysfunction was thought to be almost entirely caused by psychological factors but it is now known that physical conditions are present in about 75% of sufferers and that in many men it may be caused by a combination of both.

A wide variety of options exist for treating erectile dysfunction. They include everything from medications and simple mechanical devices to surgery and psychological counseling.

Although most men experience episodes of erectile dysfunction from time to time, preventive measures can be adopted to decrease the likelihood of occurrences.

Key words: Impotence, Sexual Dysfunction, Psychogenic, Diabetes, Penile biothesiometry, Dynamic Infusion Cavernosometry (DICC), Phosphodiesterase inhibitors.

Introduction

Erectile dysfunction (ED) or male impotence is a sexual dysfunction characterized by the inability to develop or maintain an erection of the penis.¹ Erectile dysfunction can be a total inability to achieve erection, an inconsistent ability to do so, or a tendency to sustain only brief erections.²

The word “impotence” may also be used to describe other problems that interfere with sexual intercourse and reproduction, such as lack of sexual desire and problems with ejaculation or orgasm. Using the term erectile dysfunction makes it clear that those other problems are not involved.

Erectile dysfunction, tied closely as it is to cultural notions of potency, success and masculinity, can have devastating psychological consequences including feelings of shame, loss or inadequacy; often unnecessary since in most cases the matter can be helped. There is a strong culture of silence and inability to discuss the matter. In fact around 1 in 10 men will experience recurring impotence problems at some point in their lives.¹

Epidemiology

Although erectile dysfunction, formerly called impotence, is more common in men older than 65, it can occur at any age. An occasional episode of erectile dysfunction happens to most men and is normal. As men age, it's also normal to experience changes in erectile function. Erections may take longer to develop, may not

be as rigid or may require more direct stimulation to be achieved. Men may also notice that orgasms are less intense, the volume of ejaculate is reduced and recovery time increases between erections.

When erectile dysfunction proves to be a pattern or a persistent problem, it can interfere with a man's self-image as well as his and his partner's sexual life. Erectile dysfunction may also be a sign of a physical or emotional problem that requires treatment.³

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Pathophysiology

Penile erection is managed by two different mechanisms. The first one is the reflex erection, which is achieved by directly touching the penile shaft. The second is the psychogenic erection, which is achieved by erotic stimuli. The former uses the peripheral nerves and the lower parts of the spinal cord, whereas the latter uses the limbic system of the brain. In both conditions an intact neural system is required for a successful and complete erection. Stimulation of penile shaft by the nervous system leads to the secretion of nitric oxide (NO), which causes the relaxation of smooth muscles of corpora cavernosa, and subsequently penile erection. Additionally, adequate levels of testosterone and an intact pituitary gland are required for the development of a healthy male erectile system.

As can be understood from the mechanisms of a normal erection, impotence may develop due to hormonal deficiency, disorders of the neural system, lack of adequate penile blood supply or psychological problems. Restriction of blood flow can arise from impaired endothelial function due to the usual causes associated with coronary artery disease, but can also include causation by prolonged exposure to bright light or chronic exposure to high noise levels.⁴

Lifestyle choices that contribute to heart disease and vascular problems also raise the risk of erectile dysfunction. Smoking, being overweight and avoiding exercise are possible causes of ED.

Excessive alcohol use has long been recognised as one cause of impotence, leading to the euphemism "brewer's droop," or "whiskey dick;" Shakespeare made light of this phenomenon in Macbeth.⁴

A study in 2002 found that ED can also be associated with bicycling. The number of hours on a bike and/or the pressure on the penis from the saddle of an upright bicycle is directly related to erectile dysfunction.⁴

Other possible causes are smoking, which affects blood flow in veins and arteries, and hormonal abnormalities, such as not enough testosterone.²

Iatrogenic Erectile dysfunction

A few causes of impotence may be iatrogenic. Various antihypertensives and some drugs that modify central nervous system response may inhibit erection by denying blood supply or by altering nerve activity. Psychiatric medications, especially SSRIs have been shown to cause erectile dysfunction in patients. Although usually reversible, these sexual side effects can, in rare cases, last for months or years or permanently after the drug has been completely withdrawn. This disorder is known as Post SSRI Sexual Dysfunction.

Surgical intervention for a number of different conditions may remove anatomical structures necessary to erection, damage nerves, or impair blood supply. Complete removal of the prostate gland or external beam radiotherapy of the gland are common causes of impotence; both are treatments for advanced prostate cancer. Some studies have shown that male circumcision may result in an increased risk of impotence, while others have found no such effect.⁴

Psychogenic Erectile dysfunction

Experts believe that psychological factors such as stress, anxiety, guilt, depression, low self-esteem, and fear of sexual failure cause up to 40 percent of ED cases. Men with a physical cause for ED frequently experience the same sort of psychological reactions (stress, anxiety, guilt, and depression).

The main causes of psychogenic ED can be divided into three groups, each one corresponding to a different time phase:

- 1) Immediate factors (performance anxiety);
- 2) Prior recent life events; and
- 3) Developmental vulnerabilities from childhood and adolescence.⁵

Diabetes and Erectile Dysfunction

Sexual dysfunction is a well-recognized consequence of diabetes mellitus in men. Erectile dysfunction, retrograde ejaculation and the loss of seminal emission have all been described by such patients.⁶

It is unfortunate that long-standing diabetes in men, especially those with poor control of blood glucose, often leads to impotence (erectile dysfunction). According to some studies, by age 43, 46 percent of men with type 1 diabetes experience erectile dysfunction. Some women also report diminished sexual responsiveness, probably due to decreased sensation.⁷

It is been estimated that about 35-75% of men with diabetes will experience at least some degree of erectile dysfunction during their lifetime.

Men with diabetes tend to develop erectile dysfunction 10 to 15 years earlier than men without diabetes. As men with diabetes age, erectile dysfunction becomes even more common. Above the age of 50, the likelihood of having difficulties with an erection occurs in approximately 50-60% of men with diabetes. Above age 70, there is about a 95% likelihood of having some difficulty with erectile function.⁸

Diabetes can cause neuropathy or damage to nerves throughout the body, including the penis. Damaged nerves can't communicate properly. So even though a person might be emotionally stimulated to have intercourse, nerve damage means that information isn't relayed to the penis, and it doesn't respond.

In addition, poor blood sugar control can inhibit nitric oxide production. Lack of nitric oxide can prevent the pressure of blood in the corpora cavernosa from rising enough to close off penile veins, allowing blood to flow out of the penis instead of remaining trapped for an erection.

Blood vessels can also become sclerosed by conditions that often accompany diabetes, such as cardiovascular disease. When atherosclerosis occurs in arteries that supply the penis or pelvic area, sexual function may be disrupted.⁹

Erectile dysfunction severity might be associated with poor cardiovascular prognosis in adult diabetic men with no Coronary Heart Disease.¹⁰

Coronary flow reserve in diabetic men lies at the lower end of the normal range. However, diabetics with ED frequently showed coronary artery stenosis that was not clinically symptomatic. Furthermore, conventional cardiological examinations often fail to detect these patients, although they are at ischaemic risk during medically assisted intercourse.¹¹

Diagnosing Erectile Dysfunction

Patient History

Medical and sexual histories help define the degree and nature of ED. A medical history can disclose diseases that lead to ED, while a simple recounting of sexual activity might distinguish between problems with sexual desire, erection, ejaculation, or orgasm. Using certain prescription or illegal drugs can suggest a chemical cause, since drug effects account for 25 percent of ED cases.

Physical Examination

A physical examination can give clues to systemic problems. For example, if the penis is not sensitive to touching, a problem in the nervous system may be the cause. Abnormal secondary sex characteristics, such as hair pattern, can point to hormonal problems, which would mean that the endocrine system is involved. The examiner might discover a circulatory problem by observing decreased pulses in the wrist or ankles. And unusual characteristics of the penis itself could suggest the source of the problem, for example, a penis that bends or curves when erect could be the result of Peyronie's disease.

Laboratory Tests

Several laboratory tests can help diagnose ED. Tests for systemic diseases include blood counts, urinalysis, lipid profile, and measurements of creatinine and liver enzymes. Measuring the amount of testosterone in the blood can yield information about problems with the endocrine system and is indicated especially in patients with decreased sexual desire.

A useful and simple way to distinguish between physiological and psychological impotence is to determine whether the patient ever has an erection. If never, the problem is likely to be physiological; if sometimes (however rarely), it could be physiological or psychological. The current diagnostic and statistical manual of mental diseases (DSM-IV) has included a listing for impotence.

Clinical Tests Used to Diagnose ED

Duplex ultrasound

Duplex ultrasound is used to evaluate blood flow, venous leak, signs of atherosclerosis, and scarring or calcification of erectile tissue. Injecting prostaglandin, a hormone-like stimulator produced in the body, induces erection. Ultrasound is then used to see vascular dilation and measure penile blood pressure. Measurements are compared to those taken when the penis is flaccid.

Penile nerves function

Tests such as the bulbocavernosus reflex test are used to determine if there is sufficient nerve sensation in the penis. The physician squeezes the glans (head) of the penis, which immediately causes the anus to contract if nerve function is normal. A physician measures the latency between squeeze and contraction by observing the anal sphincter or by feeling it with a gloved finger inserted past the anus. Specific nerve tests are used in patients with suspected nerve damage as a result of diabetes or nerve disease.

Nocturnal penile tumescence (NPT)

It is normal for a man to have five to six erections during sleep, especially during rapid eye movement (REM). Their absence may indicate a problem with nerve function or blood supply in the penis.

Penile biothesiometry

This test uses electromagnetic vibration to evaluate sensitivity and nerve function in the glans and shaft of the penis. A decreased perception of vibration may indicate nerve damage in the pelvic area, which can lead to impotence.

Penile Angiogram

Allows visualization of the circulation in the penis and is used during the repair of a priapism.

Dynamic Infusion Caverosometry (DICC)

DICC technique involves fluid to be pumped into the penis at a known rate and pressure. It gives a measurement of the vascular pressure in the corpus cavernosum during an erection. To do this test, a vasodilator like prostaglandin E-1 is injected to measure the rate of infusion required to get a rigid erection and to help find how severe the venous leak is.

Corpus Cavernosometry

Cavernosography, is measurement of the vascular pressure in the corpus cavernosum. Saline is infused under pressure into the corpus cavernosum with a butterfly needle, and the flow rate needed to maintain an erection indicates the degree of venous leakage. The leaking veins responsible may be visualised by infusing a mixture of saline and x ray contrast medium and performing a cavernosogram.¹²

Digital Subtraction Angiography

In DSA, the images are acquired digitally. The computer creates a mask from lower-contrast x-rays of the same area and digitally isolates the blood vessels.

Magnetic resonance angiography (MRA)

This is similar to magnetic resonance imaging. Magnetic resonance angiography uses magnetic fields and radio waves to provide detailed images of the blood vessels.¹²

Psychosocial Examination

A psychosocial examination, using an interview and a questionnaire, reveals psychological factors. A man's sexual partner may also be interviewed to determine expectations and perceptions during sexual intercourse.

Treatment

Modern drug therapy for ED made a significant advance in 1983 when British physiologist Giles Brindley, Ph.D. dropped his trousers and demonstrated to a shocked American Urological Association audience his phentolamine-induced erection. The drug Brindley injected into his penis was a non-specific vasodilator, an alpha-blocking agent, and the mechanism of action was clearly corporal smooth muscle relaxation. The effect that Brindley discovered established the fundamentals for the later development of specific, safe, orally-effective drug therapies.¹³

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Oral medications

Sildenafil, Tadalafil and Vardenafil are the commonly used drugs. All these three drugs work in the same way. Chemically known as phosphodiesterase inhibitors (PDE), these drugs enhance the effects of nitric oxide, a chemical messenger that relaxes smooth muscles in the penis. This increases the amount of blood and allows a natural sequence to occur, an erection in response to sexual stimulation. These medications don't automatically produce an erection. Instead they allow an erection to occur after physical and psychological stimulation. Many men experience improvement in erectile function after taking these medications regardless of the cause of their impotence.

The combination of these medications, which work to dilate blood vessels, can cause dizziness, low blood pressure, and circulation and heart problems.³

If taken as prescribed, PDE-5 inhibitors comprise a valuable treatment option for erectile dysfunction in men with diabetes.¹⁴

The most common side effects are aching in the penis, testicles, and area between the penis and rectum; warmth or burning sensation in the urethra; redness from increased blood flow to the penis; and minor urethral bleeding or spotting.

Prostaglandin E (alprostadil)

Alprostadil is a synthetic version of the hormone prostaglandin E. The hormone helps relax smooth muscle tissue in the penis, which enhances the blood flow needed for an erection. There are two ways to use alprostadil: Needle-injection therapy. With this method, alprostadil is injected using a fine needle into the base or side of the penis. This generally produces an erection in five to 20 minutes that lasts about an hour. Because the injection goes directly into the spongy cylinders that fill with blood, alprostadil is an effective

treatment for many men. Other drugs which can be used include papaverine and phentolamine.

Self-administered intraurethral therapy - Medicated Urethral System for Erection (MUSE). It involves using a disposable applicator to insert a tiny suppository, about half the size of a grain of rice, into the tip of the penis. The suppository, placed about two inches into the urethra, is absorbed by erectile tissue in the penis, increasing the blood flow that causes an erection.

Hormone replacement therapy

For the small number of men who have testosterone deficiency, testosterone replacement therapy may be an option.

Vacuum devices

This treatment involves the use of an external vacuum and one or more tension rings.

Vascular surgery

This treatment is usually reserved for men whose blood flow has been blocked by an injury to the penis or pelvic area. Surgery may also be used to correct erectile dysfunction caused by vascular blockages. The goal of this treatment is to correct a blockage of blood flow to the penis so that erections can occur naturally. But the long-term success of this surgery is unclear.

Penile implants

This treatment involves surgically placing a device into the two sides of the penis, allowing erection to occur as often and for as long as desired. These implants consist of either an inflatable device or semirigid rods made from silicone or polyurethane. This treatment is often expensive and is usually not recommended until other methods have been considered or tried first. As with any surgery, there is a small risk of complications such as infection.

Psychotherapy

Experts often treat psychologically based ED using techniques that decrease the anxiety

associated with intercourse. The patient's partner can help with the techniques, which include gradual development of intimacy and stimulation. Such techniques also can help relieve anxiety when ED from physical causes is being treated.

Controversial and unapproved treatments

Naltrexone :

Drug used for treating drug addicts can have some success in patients with inhibited sexual desire.¹⁵

Bremelanotide :

The experimental drug bremelanotide (formerly PT-141) does not act on the vascular system like the former compounds but allegedly increases sexual desire and drive in males as well as females. It is applied as a nasal spray. Bremelanotide allegedly works by activating melanocortin receptors in the brain. It is currently in Phase IIb trials.¹⁵

Melanotan II :

Like bremelanotide the experimental drug Melanotan II does not act on the vascular system either but increases libido. Melanotan II works by activating melanocortin receptors in the brain.

hMaxi-K.¹⁵ :

hMaxi-K is a form of gene therapy using a plasmid vector that expresses the hSlo gene, that encodes the alpha-subunit of the Maxi-K channel. It has undergone phase I safety trials.¹⁵

Prevention

Although most men experience episodes of erectile dysfunction from time to time, preventive measures can be adopted to decrease the likelihood of occurrences:

Limit or avoid the use of alcohol and other similar drugs. Stop smoking. Exercise regularly. Reduce stress. Get enough sleep. Deal with anxiety or depression. Regular medical checkups.

Hope through Research

Advances in suppositories, injectable medications, implants, and vacuum devices have expanded the options for men seeking treatment for ED. These advances have also

helped increase the number of men seeking treatment. Gene therapy for ED is now being tested in several centers and may offer a long-lasting therapeutic approach for ED.²

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