Erectile dysfunction

Erectile dysfunction (**ED**), also known as **impotence**, is a type of sexual dysfunction characterized by the inability to develop or maintain an erection of the penis during sexual activity. ED can have psychological consequences as it can be tied to relationship difficulties and self-image.

Erectile dysfunction	
Other names	Impotence
	
Cross-section of a flaccid penis	
Specialty	Urology

A physical cause can be identified in about 80% of cases.[1] These include cardiovascular disease, diabetes mellitus, neurological problems such as following prostatectomy, hypogonadism, and drug side effects. Psychological impotence is where erection or penetration fails due to thoughts or feelings; this is somewhat less frequent, on the order of about 10% of cases.[1] In psychological impotence, there is a strong response to placebo treatment. The term *erectile dysfunction* is not used for other disorders of erection, such as priapism.

Treatment involves addressing the underlying causes, lifestyle modifications, and addressing psychosocial issues.[1] In many cases, a trial of pharmacological therapy with a PDE5 inhibitor, such as sildenafil, can be attempted. In some cases, treatment can involve inserting prostaglandin pellets into the urethra, injecting smooth muscle relaxants and vasodilators into the penis, a penile prosthesis, a penis pump, or vascular reconstructive surgery.[1][2] It is the most common sexual problem in men.[3]

Contents

Signs and symptoms

ED is characterized by the regular or repeated inability to achieve or maintain an erection of sufficient rigidity to accomplish sexual activity. It is defined as the "persistent or recurrent inability to achieve and maintain a penile erection of sufficient rigidity to permit satisfactory sexual activity for at least 3 months."[1]

Psychological impact

ED often has an impact on the emotional well-being of both men and their partners. Many men do not seek treatment due to feelings of embarrassment. About 75% of diagnosed cases of ED go untreated.[4]

Causes

Causes of or contributors to ED include the following:

- Prescription drugs (e.g., SSRIs,[5] beta blockers, alpha-2 adrenergic receptor agonists, thiazides, hormone modulators, and 5α-reductase inhibitors)[3][1]
- Neurogenic disorders (e.g., diabetic neuropathy, temporal lobe epilepsy, multiple sclerosis, Parkinson's disease, multiple system atrophy)[3][1][6]
- Cavernosal disorders (e.g., Peyronie's disease)[3][7]
- Hyperprolactinemia (e.g., due to a prolactinoma)[3]
- Psychological causes: performance anxiety, stress, and mental disorders[8]
- Surgery (e.g., radical prostatectomy) [9]
- Aging: It is four times more common in men aged in their 60s than those in their 40s.[10]
- Kidney failure
- Lifestyle habits, particularly smoking, which is a key risk factor for ED as it promotes arterial narrowing.[11][12][13]

Surgical intervention for a number of conditions may remove anatomical structures necessary to erection, damage nerves, or impair blood supply.[9] ED is a common complication of treatments for prostate cancer, including prostatectomy and destruction of the prostate by external beam radiation, although the prostate gland itself is not necessary to achieve an erection. As far as inguinal hernia surgery is concerned, in most cases, and in the absence of postoperative complications, the operative repair can lead to a recovery of the sexual life of people with preoperative sexual dysfunction, while, in most cases, it does not affect people with a preoperative normal sexual life.[14]

ED can also be associated with bicycling due to both neurological and vascular problems due to compression.[15] The increase risk appears to be about 1.7-fold.[16]

Concerns that use of pornography can cause ED[17] have little support in epidemiological studies, according to a 2015 literature review.[18]

Pathophysiology

Penile erection is managed by two mechanisms: the reflex erection, which is achieved by directly touching the penile shaft, and the psychogenic erection, which is achieved by erotic or emotional stimuli. The former involves the peripheral nerves and the lower parts of the spinal cord, whereas the latter involves the limbic system of the brain. In both cases, an intact neural system is required for a successful and complete erection. Stimulation of the penile shaft by the nervous system leads to the secretion of nitric oxide (NO), which causes the relaxation of the smooth muscles of the corpora cavernosa (the main erectile tissue of the penis), and subsequently penile erection. Additionally, adequate levels of testosterone (produced by the testes) and an intact pituitary gland are required for the development of a healthy 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.[19] Spinal cord injury causes sexual dysfunction, including ED. Restriction of blood flow can arise from impaired endothelial function due to the usual causes associated with coronary artery disease, but can also be caused by prolonged exposure to bright light.

Diagnosis

In many cases, the diagnosis can be made based on the person's history of symptoms. In other cases, a physical examination and laboratory investigations are done to rule out more serious causes such as hypogonadism or prolactinoma.[1]

One of the first steps is to distinguish between physiological and psychological ED. Determining whether involuntary erections are present is important in eliminating the possibility of psychogenic causes for ED.[1] Obtaining full erections occasionally, such as nocturnal penile tumescence when asleep (that is, when the mind and psychological issues, if any, are less present), tends to suggest that the physical structures are functionally working.[20][21] Similarly, performance with manual stimulation, as well as any performance anxiety or acute situational ED, may indicate a psychogenic component to ED.[1]

Other factors leading to ED are diabetes mellitus, which is a well-known cause of neuropathy).[1] ED is also related to generally poor physical health, poor dietary habits, obesity, and most specifically cardiovascular disease, such as coronary artery disease and peripheral vascular disease.[1] Screening for cardiovascular risk factors, such as smoking, dyslipidemia, hypertension, and alcoholism is helpful.[1]

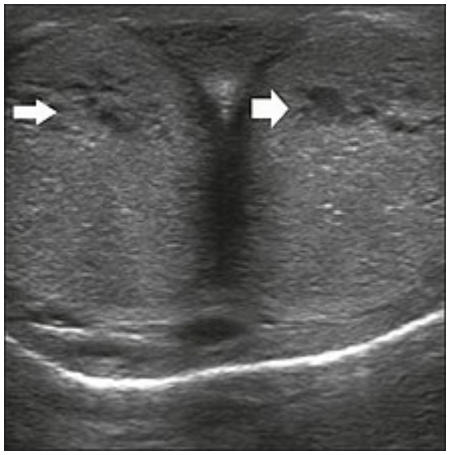
In some particular cases, the simple search for a previously undetected groin hernia can prove useful since it can affect sexual functions in men and is relatively easily curable.[14]

The current diagnostic and statistical manual of mental diseases (DSM-IV) has included a listing for ED.

Ultrasonography

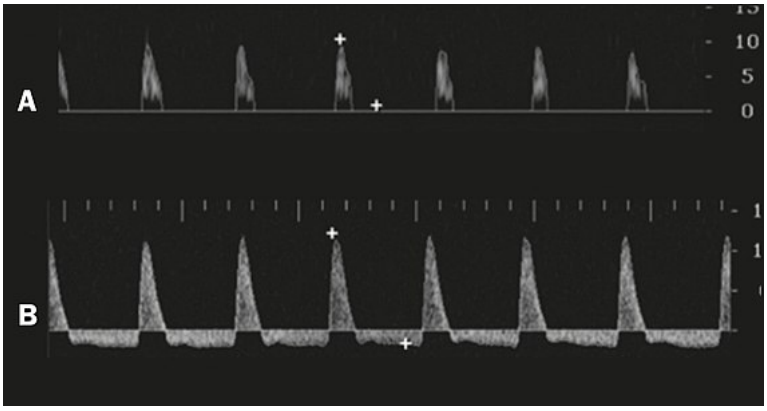
Penile ultrasonography with doppler can be used to examine the penis in erected state. Most cases of ED of organic causes are related to changes in blood flow in the corpora cavernosa, represented by occlusive artery disease, most often of atherosclerotic origin, or due to failure of the veno-occlusive mechanism. Preceding the ultrasound examination with Doppler, the penis should be examined in B mode, in order to identify possible tumors, fibrotic plaques, calcifications, or hematomas, as well as to evaluate the appearance of the cavernous arteries, which can be tortuous or atheromatous.[22]

Erection can be induced by injecting 10-20 µg of prostaglandin E1, with evaluations of the arterial flow every five minutes for 25-30 min (see image). The use of prostaglandin E1 is contraindicated in patients with a predisposition to priapism (e.g., those with sickle cell anemia), as well as in those with an anatomical deformity of the penis or a penile implant. Phentolamine (2 mg) is often added. Visual and tactile stimulation produces better results. Some authors recommend the use of sildenafil by mouth to replace the injectable drugs in cases of contraindications, although the efficacy of such medication is controversial.[22]

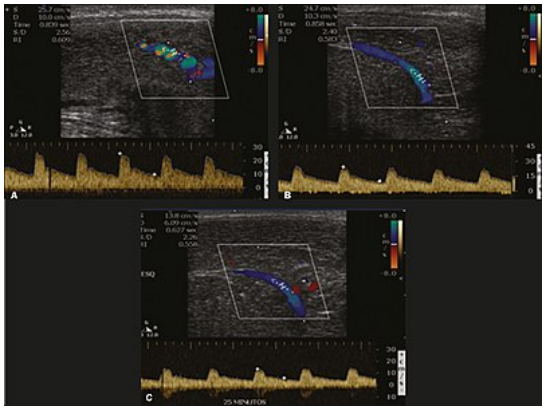


Transverse ultrasound image, ventral view of the penis. Image obtained after induction of an erection, 15 min after injection of prostaglandin E1, showing dilated sinusoids (arrows).[22]

Prior to the injection of the chosen drug, the flow pattern is monophasic, with low systolic velocities and an absence of diastolic flow. After injection, it is expected that systolic and diastolic peak velocities will increase, decreasing progressively with vein occlusion and becoming negative when the penis becomes rigid (see image below). The reference values vary across studies, ranging from > 25 cm/s to > 35 cm/s. Values above 35 cm/s indicate the absence of arterial disease, values below 25 cm/s indicate arterial insufficiency, and values of 25–35 cm/s are indeterminate because they are less specific (see image below). The data obtained should be correlated with the degree of erection observed. If the peak systolic velocities are normal, the final diastolic velocities should be evaluated, those above 5 cm/s being associated with venogenic ED.[22]



Graphs representing the color Doppler spectrum of the flow pattern of the cavernous arteries during the erection phases. A: Single-phase flow with minimal or absent diastole when the penis is flaccid. B: Increased systolic flow and reverse diastole 25 min after injection of prostaglandin.[22]



Longitudinal, ventral ultrasound of the penis, with pulsed mode and color Doppler. Flow of the cavernous arteries at 5, 15, and 25 min after prostaglandin injection (A, B, and C, respectively). Note that the cavernous artery flow remains below the expected levels (at least 25–35 cm/s), which indicates ED due to arterial insufficiency.[22]

Other workup methods

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.

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. There are two methods for measuring changes in penile rigidity and circumference during nocturnal erection: snap gauge and strain gauge. A significant proportion of men who have no sexual dysfunction nonetheless do not have regular nocturnal erections.

Penile biothesiometry

This test uses electromagnetic vibration to evaluate sensitivity and nerve function in the glans and shaft of the penis.

Dynamic infusion cavernosometry (DICC)

technique in which fluid is 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.

Corpus cavernosometry

Cavernosography 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 visualized by infusing a mixture of saline and x-ray contrast medium and performing a cavernosogram.[23] In Digital Subtraction Angiography (DSA), the images are acquired digitally.

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. Doctors may inject a "contrast agent" into the person's bloodstream that causes vascular tissues to stand out against other tissues. The contrast agent provides for enhanced information regarding blood supply and vascular anomalies.

Treatment

Treatment depends on the underlying cause. In general, exercise, particularly of the aerobic type, is effective for preventing ED during midlife.[24]:6, 18–19 Counseling can be used if the underlying cause is psychological, including how to lower stress or anxiety related to sex.[25] Medications by mouth and vacuum erection devices are first-line treatments,[24]:20, 24 followed by injections of drugs into the penis, as well as penile implants.[24]:25–26 Vascular reconstructive surgeries are beneficial in certain groups.[26] Treatments, other than surgery, do not fix the underlying physiological problem, but are used as needed before sex.[27]

Medications

The PDE5 inhibitors sildenafil (Viagra), vardenafil (Levitra) and tadalafil (Cialis) are prescription drugs which are taken by mouth.[24]:20–21 As of 2018, sildenafil is available in the UK without a prescription.[28] Additionally, a cream combining alprostadil with the permeation enhancer DDAIP has been approved in Canada as a first line treatment for ED.[29] Penile injections, on the other hand, can involve one of the following medications: papaverine, phentolamine, and prostaglandin E1, also known as alprostadil.[24] In addition to injections, there is an alprostadil suppository that can be inserted into the urethra. Once inserted, an erection can begin within 10 minutes and last up to an hour.[25] Medications to treat ED may cause a side effect called priapism.[25]

Testosterone

Men with low levels of testosterone can experience ED. Taking testosterone may help maintain an erection.[30] Men with type 2 diabetes are twice as likely to have lower levels of testosterone, and are three times more likely to experience ED than non-diabetic men.[30]

Pumps

A vacuum erection device helps draw blood into the penis by applying negative pressure. This type of device is sometimes referred to as penis pump and may be used just prior to sexual intercourse. Several types of FDA approved vacuum therapy devices are available under prescription. When pharmacological methods fail, a purpose-designed external vacuum pump can be used to attain erection, with a separate compression ring fitted to the base of the penis to maintain it. These pumps should be distinguished from other penis pumps (supplied without compression rings) which, rather than being used for temporary treatment of impotence, are claimed to increase penis length if used frequently, or vibrate as an aid to masturbation. More drastically, inflatable or rigid penile implants may be fitted surgically.

Surgery

Often, as a last resort if other treatments have failed, the most common procedure is prosthetic implants which involves the insertion of artificial rods into the penis.[24]:26 Some sources show that vascular reconstructive surgeries are viable options for some people.[26]

Alternative medicine

The Food and Drug Administration (FDA) does not recommend alternative therapies to treat sexual dysfunction.[31] Many products are advertised as "herbal viagra" or "natural" sexual enhancement products, but no clinical trials or scientific studies support the effectiveness of these products for the treatment of ED, and synthetic chemical compounds similar to sildenafil have been found as adulterants in many of these products.[32][33][34][35][36] The FDA has warned consumers that any sexual enhancement product that claims to work as well as prescription products is likely to contain such a contaminant.[37]

History

Attempts to treat ED date back well over 1,000 years. In the 8th century, men of Ancient Rome and Greece wore talismans of rooster and goat genitalia, believing these talismans would serve as an aphrodisiac and promote sexual function.[38] In the 13th century Albertus Magnus recommended ingesting roasted wolf penis as a remedy for impotence.[38]

During the late 16th and 17th centuries in France, male impotence was considered a crime, as well as legal grounds for a divorce. The practice, which involved inspection of the complainants by court experts, was declared obscene in 1677.[39][40]

An unhappy wife is complaining to the qadi about her husband's impotence. Ottoman miniature.

The first successful vacuum erection device, or penis pump, was developed by Vincent Marie Mondat in the early 1800s.[38] A more advanced device, based on a bicycle pump, was developed by Geddings Osbon, a Pentecostal preacher, in the 1970s. In 1982, he received FDA approval to market the product as the ErecAid®.[41]

John R. Brinkley initiated a boom in male impotence cures in the U.S. in the 1920s and 1930s. His radio programs recommended expensive goat gland implants and "mercurochrome" injections as the path to restored male virility, including operations by surgeon Serge Voronoff.

Modern drug therapy for ED made a significant advance in 1983, when British physiologist Giles Brindley dropped his trousers and demonstrated to a shocked Urodynamics Society audience his papaverine-induced erection.[42] 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, and orally effective drug therapies.[43][44]

The current first-line treatment for ED, the oral PDE5 inhibitor, was introduced by Pfizer in 1999.[45]

Lexicology

The Latin term *impotentia coeundi* describes simple inability to insert the penis into the vagina; it is now mostly replaced by more precise terms, such as *erectile dysfunction* (ED). The study of ED within medicine is covered by andrology, a sub-field within urology. Research indicates that ED is common, and it is suggested that approximately 40% of males experience symptoms compatible with ED, at least occasionally.[46] The condition is also on occasion called *phallic impotence*.[47] Its antonym, or opposite condition, is priapism.[48][49]

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External links

- Erectile dysfunction (https://curlie.org/Health/Men%27s_Health/Conditions_and_Diseases/Impotence/Resources/) at Curlie

Classification	**ICD-10**: F52.2 (http://apps.who.int/classifications/icd10/browse/2016/en#/F52.2), N48.4 (http://apps.who.int/classifications/icd10/browse/2016/en#/N48.4) · **ICD-9-CM**: 302.72 (http://www.icd9data.com/getICD9Code.ashx?icd9=302.72), 607.84 (http://www.icd9data.com/getICD9Code.ashx?icd9=607.84) · **MeSH**: D007172 (https://www.nlm.nih.gov/cgi/mesh/2015/MB_cgi?field=uid&term=D007172) · **DiseasesDB**: 21555 (http://www.diseasesdatabase.com/ddb21555.htm)
External resources	**eMedicine**: med/3023 (https://emedicine.medscape.com/med/3023-overview) · **Patient UK**: Erectile dysfunction (https://

patient.info/doctor/erectile-dysfunction)