

## Erectile Dysfunction in Men

K.C.Mohanty MBBS; MD; Dip.Ven; Dip.HCE(Ethics); DFFP

Consultant Physician in Genito-urinary Medicine, Darlington Memorial Hospital

Correspondence to [Kailash.Mohanty@cddft.nhs.uk](mailto:Kailash.Mohanty@cddft.nhs.uk)

### Introduction

To manage any disease it is necessary to understand its pathophysiology. Sexual intercourse depends upon a man being able to develop and retain an erection long enough to enter in to the vagina and ejaculate. In both men and women sexual response is divided in to four phases i.e. excitement phase, plateau phase, orgasmic phase and finally the resolution phase.

In the male the excitement phase starts with the erection of the penis. This results from physical and/or psychological stimulation. The two corpora in the penis fill up with blood through various valves from helicine arteries.

This is followed by the plateau phase in which the diameter of the glans increases as a result of congestion. The size of the testicles may increase by 50%<sup>1</sup>. Excitement phase and plateau phase are very closely related.

The orgasmic and ejaculation phases are different but generally taken to be synonymous. This is the climax of sexual intercourse. The vas deferens, prostate and seminal vesicles contract. The rectal sphincter and neck of the bladder tighten and semen is forced out. Androgen is essential in ejaculation.

After ejaculation there is the resolution phase. This is a refractory or recovery period during which a further erection is not possible. It varies from a few minutes to a few hours. Detumescence (flaccid penis) occurs during this stage. Sexual excitement without orgasm can lead to slow resolution.

### Endocrine Function

The hypothalamus is the main regulatory centre for production of various sex hormones. It receives messages from the central nervous system (CNS) and testes to regulate the synthesis of gonadotrophin releasing hormone (GRH). GRH stimulates the pituitary to produce LH and FSH. LH stimulates Leydig cells of the testis to produce testosterone in a diurnal manner with a peak in the morning. 54% of testosterone is bound to albumin and other proteins. 44% of testosterone is bound to a globulin called sex hormone binding protein (SHBG) and 2% is free. Testosterone is converted to dihydrotestosterone

(DHT) by 5-alpha reductase. DHT then binds to androgen receptor complex to exert its androgenic effect.

### Male Sexual problems

Various studies in the general population showed that 15-20% of men describe some sort of sexual problem<sup>1</sup>. Erectile dysfunction is the main problem and a lot of emphasis has been given to this condition recently. 40% of men have some degree of erectile dysfunction at the age of 40 which increases to 70% at the age of 70.<sup>1</sup>

The main types of erectile dysfunction are:

- (a) Psychogenic
- (b) Vasculogenic
- (c) Neurogenic
- (d) Endocrinogenic
- (e) Side effects of drugs

### Psychogenic impotence

This can affect the excitement, plateau and ejaculation phases. It can cause premature, delayed or absent ejaculation. In 1970 Masters and Johnson reported that 95% of erectile dysfunction was psychogenic,<sup>2</sup> which is not true. A study in 1988 showed that only 39.7% is purely psychogenic.<sup>3</sup>

Anxiety and mood can reduce arousal in men. These are influenced by culture, religion, society, education, genetics, family and experience. Although there is no difference between male and female sexual stimuli, it has been reported that men respond to visual stimuli whereas females to auditory and written stimuli. Psychiatric disorders and/or their drug treatment can lead to sexual dysfunction.

### Diagnosis.

An early morning erection with a full bladder makes this the most likely cause of the problem. Masturbation will also produce an erection. Careful assessment for depression can be made with various tests i.e. Beck Depression Inventor (BDI), Short Marital Adjustment Test (SMAT), Dyadic Adjustment Inventory (DAI), ICD-10 (International Classification of diseases, 10th

revision) and DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, fourth revision). These tests do not diagnose sexual dysfunction but simply suggest a possible link. Therefore one has to be careful how to interpret the results. Sexual Interaction Inventory (SII) is a questionnaire designed to find out about sexual activity. It is a useful tool especially to explore complex interpersonal sexual relationships. A score above 70 indicates a large degree of pathology.

The "stamp test" is a novel and simple way to detect nocturnal penile tumescence (NPT). A strip of stamps is wrapped around the shaft of penis before going to bed. If it is broken in the morning it suggests normal erectile function and therefore a psychogenic impotence. Alternatively an instrument called a RigiScan can be used.

**Treatment.**

Psychotherapy is the main treatment. There are various forms of psychotherapy designed to meet individual needs. They include individual psychotherapy, psychoanalytic therapy, behavioural therapy, cognitive behavioural therapy (CBT), and group therapy. Antidepressants, especially a selective serotonin reuptake inhibitor (SSRI) with CBT, are useful. However a report published in July 2007 showed that there was no extra advantage in moderate to severe depression in adolescents with both therapies combined. If psychotherapy fails drug therapy is the next option. This is discussed later in this article.

**Vasculogenic impotence**

This mainly affects the excitement phase. Vascular problems can affect the penis but also the limbic system. The following conditions have significant vascular damage contributing to erectile failure;

- (a) Diabetes
- (b) Peripheral vascular disease
- (c) Consumption of alcohol, tobacco and illicit drugs
- (d) Progressive systemic arteriosclerosis
- (e) Peripheral vasoconstriction by beta blockers
- (f) Age: after 40 years old the vascular valves of

the penis deteriorate.

**Diagnosis**

On examination the genitalia will feel cold due to lack of circulation. There will be no early morning erection with a full bladder nor with masturbation. The following laboratory tests can be done to confirm a diagnosis;

- (a) Cavernosography for venous leakage
- (b) Pharmacological arteriography
- (c) Duplex ultrasound scan
- (d) Dual isotope studies
- (e) Penile brachial index
- (f) Combined injection and stimulation test (CIS)

The CIS is an intra-cavernosal injection of 20 microgrammes of alprostadil (prostaglandin E1) into one of the corpora cavernosa. After 30 minutes an erection should occur. If there is no erection there is vasculogenic impotence.

**Treatment**

In its initial stages drug therapy may work.

Cavernosal pharmacotherapy (intracavernous pharmacotherapy, ICPT) is performed by injection into the penile cavernosa (Fig 1).

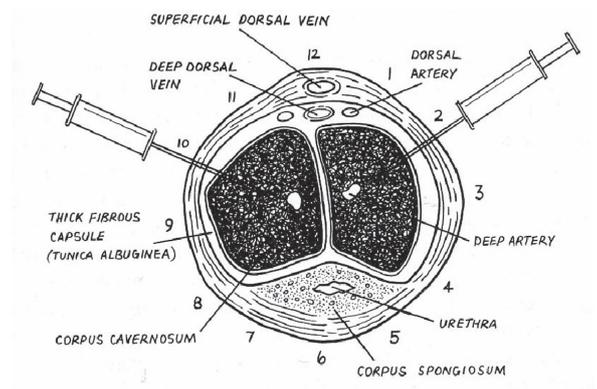


Fig 1. Intracavernosal pharmacotherapy (site of intracavernosal injection)

Papaverine was the first ICPT used in 1977. In 1994 Upjohn Pharmaceuticals developed a prostaglandin E1 called alprostadil which replaced Papaverine. Alprostadil is now licensed

and available as Caverject, and Viridal,. Patients are trained to self inject. The dose is 5mcg to 40 mcg half an hour before sex. Dose titration is required to prevent priapism (painful continuous erection of the penis).

Intra-urethral application of alprostadil is know as MUSE, (Medicated Urethral System for Erection). This is licensed in UK. It is a tiny pellet placed inside an applicator in doses of 125, 250, 500mcg and 1gm. It is inserted inside the urethra about half an hour before sex and patients are advised to pass urine immediately before to ease the insertion. Then the penis is rocked and the patient walks for 15 minutes to get a good response.

Sildenafil is a phosphodiesterase type 5 (PDE-5) inhibitor. It is the most famous of modern treatments. Pfizer Pharmaceuticals produced Viagra, in 1998 in USA. Nitric Oxide (NO) is released from nerve endings and endothelial cells in the penis, which leads to formation of cGMP that causes the erection of penis. The enzyme PDE-5 breaks down the cGMP to inactive cGMP. This results in a flaccid penis. Sildenafil inhibits the PDE-5 so that erection is produced and maintained. It is marketed as 50mg and 100mg. Patients are advised to take at least one hour before sex and must engage in manual stimulation of penis to produce NO and cGMP. Then Sildenafil inhibits PDE-5 not to break down cGMP. The side effects include headache, flushing, nasal congestion, visual disturbance. Sildenafil causes hypotension and should not be given to patients who use nitrates or have had heart attacks (MI) within previous six months. Another PDE5 inhibitor is Vardenafil (available as Levitra, in doses of 10mg & 20mg), Tadalafil, and Cialis, in the doses of 10mg and 20 mg. [Sildenafil ahs also been found to be useful in the treatment of primary pulmonary hypertension- Ed.]

Apomorphine HCL is a centrally acting drug. It is licensed in UK as Uprima, and given sublingually 2mg half an hour before sex.

Phentolamine mesylate is an alpha-1 and 2 adrenergic receptor antagonist not licensed in UK. It is developed by Schering Plough and known as Vsomax,.

Nitroglycerine (a vasodilator) in the form of paste or patches is applied locally to the shaft of penis half an hour before sexual intercourse

which can produce an erection. Side effects include headache, flushing, dizziness, postural hypotension etc.

If drug therapy fails then management is with vacuum tumescence devices (Fig 2) or surgical procedures (Fig 3).

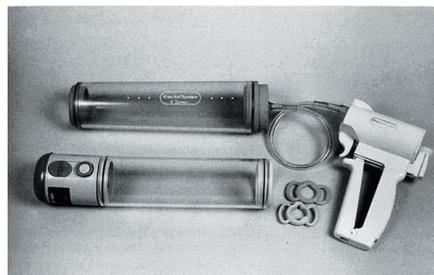


Fig 2. Manual and semiautomatic vacuum devices

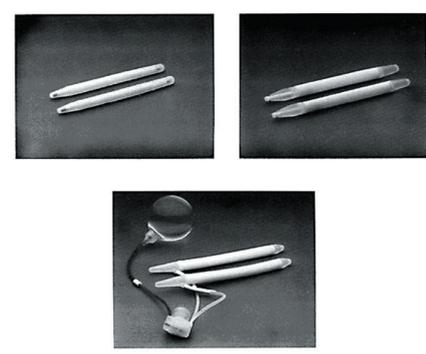


Fig 3. Malleable, self contained and inflatable prostheses

Patients are trained to use vacuum devices to pump away air to produce a negative pressure which draws blood inside the penis to produce the erection. There has been a lot of research on various pumps and rings to suit the individual patient. If this fails the last resort is to insert implants inside the penis surgically. Complications are permanent erection, infection and reject of the prosthesis. There are some forms of inflatable two piece and inflatable three piece prostheses that allow the penis to be erected when required.

Revascularisation of stenosed arteries and surgery to venous leaks can in some cases permanently cure the problem.

## Neurogenic Impotence

Any nerve damage due to accidental or operative injury can lead to neurogenic impotence.

### Diagnosis

There is no early morning erection with full bladder. The glandipudendal reflex is absent if there is damage to the sympathetic nerves in the inferior hypogastric plexus or a lower motor neurone lesion involving spinal segments of S2, S3 and S4. Electrical stimulation of S2, S3 and S4 can produce an erection. The diagnostic test is to give intracavernosal injection of 5 microgrammes of alprostadil. The result will be a strong erection with this low dose. A standard dose may produce priapism.

### Treatment

This is with low dose intracavernosal alprostadil, vacuum tumescence devices or prostheses (see above)

## Endocrinogenic Impotence

### Diagnosis

A full history and examination should yield clues of an endocrinopathy e.g. gynaecomastia or micropenis.

The serum levels of testosterone, LH and FSH are very important in assessing sexual dysfunction. Prolactin is also a very important hormone. In pituitary tumours a large amount of prolactin is secreted which has an inverse effect on androgen secretion. Stress and certain drugs can increase the production of prolactin and reduce the androgen levels. Hyperthyroidism can increase estradiol level which inhibits the Leydig cells. Hypogonadism, diabetes and kidney failure can produce sexual dysfunction. Therefore in addition to tests for testosterone, LH, FSH, SHBG and prolactin, thyroid function tests, blood sugar and renal function tests should be carried out.

### Treatment

This depends on correcting the underlying condition.

Testosterone is the main treatment. It is ideal in hypogonadism and in low testosterone levels. It can increase the risk of benign hyperplasia of prostate and prostate cancer. Long term treatment should be monitored. Injections

and sub dermal implants are usually used. In cases of mild to moderate hyperprolactinaemia testosterone is ideal to reduce the level of prolactin but in case of pituitary tumour bromocriptine will be necessary.

## Erectile dysfunction due to drugs

The following drugs can cause erectile dysfunction

- (a) Antihypertensives: thiazide diuretics, beta blockers
- (b) Antidepressants
- (c) Antipsychotics
- (d) Anticonvulsants
- (e) Mood stabilisers
- (f) H<sub>2</sub>-antagonists
- (g) Lipid lowering drugs
- (h) Cytotoxic drugs
- (i) Others like opiates, digoxin, disulfiram, antiandrogens
- (j) Alcohol
- (k) Nicotine (smoking)

### Treatment

The offending drug is discontinued and replaced with one with no such side effects. This should be done carefully and in consultation with the original prescriber and/or GP to avoid a relapse of the condition for which it was prescribed. Sometimes the dose is reduced if it can not be stopped.

Alcohol is believed to enhance the desire but inhibits the arousal in excitement phase and often produces undesirable behavioural effects. Chronic alcoholism causes disturbance in hypothalamus-pituitary axis and lowers the testosterone level.

Smoking can produce erectile dysfunction and giving up smoking leads to improvement

## Summary

Fifteen to twenty percent of men describe some sort of erectile problem. History and examination usually reveal the type of erectile dysfunction. If there is an early morning erection then the problems are usually psychological. Reducing alcohol and stopping smoking may help. Treatment for other conditions needs to be altered carefully and in consultation with others. If these interventions fail then there are pharmacological interventions. If drugs fail vacuum and surgical devices are the last resort.

## References

1. **Tomlinson** (1999) ABC of Human Sexuality, *BMJ Books*
2. **Mohanty KC** (2001) Sexual Behaviour & Sexual Dysfunction in Men *2nd Edition* *KCM Academic Publications, Shipley, West Yorks*
3. **Melman A, Tiefer L, Pedersen R.** (1988) Evaluation of first 496 patients in Urology Department based centre for male sexual deviation. *Urology* 6:6-10