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Review Article

# Diagnosis of Erectile Dysfunction

**A. Abdel Raheem , C.-Y. Li, G. Garaffa, A. Sacca and D. J. Ralph**

*St. Peter's Department of Andrology, The Institute of Urology, London, UK*

## ABSTRACT

Erectile dysfunction (ED) is a problem that may affect up to 52% of men aged between 40 and 70. In the era of type-5 phosphodiesterase (PDE5) inhibitors, the treatment of ED can be simple and effective after the correct diagnosis which is made in the majority of cases with history, examination and some basic laboratory tests.

**Keywords :** Erectile dysfunction, diagnosis, review

**Corresponding Author:** Mr. Amr Abdel Raheem Mohamed, 2nd Floor, Maple House, Rosenheim Wing Grafton Way, London WC1E 5DB, Great Britain. Email: amr_raheem@hotmail.com

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## INTRODUCTION

Erectile dysfunction (ED) is defined as the consistent or recurrent inability to attain and / or maintain an erection sufficient for sexual performance[1]. The overall prevalence of ED in men aged between 40 and 70 has been reported to be 52% (minimal in 17.2%, moderate in 25.2% and severe in 9.6%)[2]. The incidence of ED increases with age, however, it is important to remember that it is not an inevitable consequence of aging and that advancing age does not preclude sexual interest. With increasing life expectancy, it is anticipated that the prevalence of ED will rise[3].

Recent studies have demonstrated associations between ED and cardiovascular diseases; consequently the management of ED now concentrates on screening for, and prevention of cardiovascular diseases as well as treating the ED itself[4].

In the era of PDE5 inhibitors the treatment of ED can be simple and effective with good response rates. Other lines of therapy such as intracorporeal injections or penile implants are resorted to in patients who fail to respond to PDE5 inhibitors. A patient-oriented approach to the diagnosis and treatment of ED is preferred for the majority of men (Table 1)[5]. This entails that a medical and psychosexual history, physical examination and basic laboratory investigations are done for all patients, while other investigatory modalities are reserved for selected cases[6]. Following the initial assessment, the available treatment options, including the benefits and the potential complications of each modality, should be explained to the patient. The treatment plan is thus formulated jointly between the physician and patient. Where possible, the patient's partner should be involved and the patient's preferences, concerns and expectations should be taken into consideration[7,8]. This allows the formulation of a treatment plan which can be tailored to the needs and lifestyle of an individual patient.

## SEXUAL AND MEDICAL HISTORY

Obtaining a detailed sexual history is essential for the accurate diagnosis and successful treatment of ED, and should

**Table 1:** The Brief Sexual Symptom Checklist[14]

1- Are you satisfied with your sexual function? Yes / No. If No, please continue.
2- How long have you been dissatisfied with your sexual function?
3- a. The problem (s) with your sexual function is : (mark one or more)
    1. problems with little or no interest in sex
    2. problems with erection
    3. problems with ejaculation too early during sexual activity
    4. problems taking too long, or not being able to ejaculate or have orgasm
    5. problems with pain during sex
    6. problems with penile curvature during erection
    7. others

    b. Which problem is most bothersome
4- Would you like to talk about it with your doctor?

**Table 2:** Features of organic versus psychogenic ED.

| **Organic** | **Psychogenic** |
|---|---|
| Older population | Younger patients |
| Gradual onset* | Sudden onset |
| No morning tumescence | Good morning tumescence |
| Normal ejaculation and libido | premature ejaculation / inability to ejaculate |
| Risk factors in previous medical history | Recent life events / relationship problems |
| Drugs / smoking | Psychological problems |

*except secondary to trauma or surgery

identify whether the problem is truly ED or another type of sexual dysfunction. It will also help determine the severity of ED and whether the problem is psychogenic or organic.

The sexual history includes onset, course and duration of the problem. Psychogenic ED is more likely if of acute onset, short duration and intermittent course, while organic ED is more likely to be of long duration, gradual onset and progressive or constant course (Table 2)[9]. The degree of sexual desire may be reduced in androgen deficiency, depression, stress and loss of interest in the partner, so it is important to know if the low libido is generalized or specific to one partner. Hardness of the erection and its duration, the presence of non-coital erections (preserved in psychogenic ED) and the ability to penetrate are important features to note. It is also important to ask if the patient achieves orgasm and ejaculation and whether it is painful or premature, as ED and ejaculatory dysfunction can occur together[10].

When obtaining a sexual history it is vital to ask about the quality and frequency of morning erections; in psychogenic ED morning erections are preserved, while in organic ED morning erections are lost[9]. It is also vital to ask about the partner's age, libido, general health, interpersonal issues and female sexual dysfunction problems which may be associated with the patient's ED[11].

A good medical history should be obtained to identify any risk factors for ED. ED may be a manifestation of an underlying medical condition such as diabetes, hypertension, cardiovascular disease, depression, neurological

**Table 3:** IIEF 5[15]

| | | | | | | |
|---|---|---|---|---|---|---|
| How do you rate your confidence that you could get and keep an erection? | | Very low<br>1 | Low<br>2 | Moderate<br>3 | High<br>4 | Very High<br>5 |
| When you had erections with sexual stimulation, how often were your erections hard enough for penetration (entering your partner)? | No sexual activity<br>0 | Almost never or never<br>1 | A few times <half time<br>2 | Sometimes about half time<br>3 | Most times >half time<br>4 | Almost always or always<br>5 |
| During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner? | Did not attempt intercourse<br>0 | Almost never or never<br>1 | A few times <half time<br>2 | Sometimes about half time<br>3 | Most times >half time<br>4 | Almost always or always<br>5 |
| During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse? | Did not attempt intercourse<br>0 | Extremely difficult<br>1 | Very difficult<br>2 | Difficult<br>3 | Slightly difficult<br>4 | Not difficult<br>5 |
| When you attempted sexual intercourse, how often was it satisfactory for you? | Did not attempt intercourse<br>0 | Almost never or never<br>1 | A few times <half time<br>2 | Sometimes about half time<br>3 | Most times >half time<br>4 | Almost always or always<br>5 |

ED severity based on IIEF-5 scores:

Severe ED (1-7); Moderate ED (8-11); Mild to moderate ED (12-16); Mild ED (17-21); No ED (22-25)

and endocrine diseases, which can then be investigated separately[12-14]. ED can also result from trauma to the pelvis or perineum or from pelvic surgery. Identifying such conditions is important in order to correct them and reverse ED, or at least improve the response to therapy and at the same time treat these conditions to prevent other complications.

After history taking one should have an idea whether ED is psychogenic or organic, and whether organic ED is vasculogenic, neurogenic, endocrine, iatrogenic or due to local penile causes. However, it is important to remember that in practice the etiology of ED is multifactorial in most cases.

ED can be objectively assessed using self-administered questionnaires. These can be used in assessing the severity of ED or as a research tool for assessing the response to treatment. The validated questionnaire which is most often used is the International Index of Erectile Function (IIEF) (Table 3)[5,15]. The Sexual Health Inventory for Men (SHIM) is a simpler version of the IIEF and can be easily used in clinical practice[15]. Some clinicians use the Centers for the Epidemiologic Survey-Depression (CES-D) questionnaire to assess if the patient has depression, which may be a cause or a consequence of ED[16].

## PHYSICAL EXAMINATION

A general examination should include measurement of the blood pressure, weight and waist circumference, since ED can be associated with the metabolic syndrome[17]. Signs of androgen deficiency should be looked for and these include gynecomastia, deficient facial hair, absent temporal hair recession, female-pattern pubic hair and fat deposition in the lower body segment[18].

The penis is examined for size and site of the urethral meatus, it is inspected for any cause of pain such as balanitis and other inflammatory lesions, and palpated for tenderness or plaques (Peyronie's disease). The retractability of the foreskin is also assessed. The penis is gently stretched to measure stretched length and check for extensibility

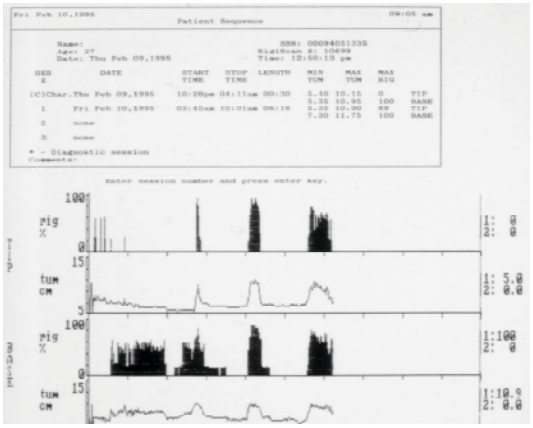

**Fig. 1:** Rigiscan recording of NPTR

**Fig. 2:** Rigiscan machine.

which can be affected in penile fibrosis[19]. The scrotum is examined for testicular size (small testes suggest hypogonadism) and any large hydrocele or hernia that can make intercourse difficult. Digital rectal examination is done to check for the size and consistency of the prostate in patients of 50 years or older or when androgen replacement therapy is being considered.

Examination for genital sensation may be done through simple clinical tests such as the scrotal reflex, where the application of a cold object to the scrotum leads to contraction of the dartos muscle and elevation of the hemiscrotum on that side or the bulbocavernous reflex, where squeezing the glans penis leads to contraction of the anal sphincter around the examining finger[20].

## LABORATORY TESTS

ED may be part of the metabolic syndrome. Therefore, fasting blood glucose and lipid levels should be measured in all patients presenting with ED who have no previous diagnosis of diabetes or hyperlipidemia[21]. Men with ED should have the morning testosterone level checked[14], because testosterone is vital for normal sexual function and its replacement in cases of deficiency improves the libido and the response to PDE5 inhibitors[22].

Aging causes a decline in serum testosterone levels; this is known as partial androgen deficiency of the aging male (PADAM). Restoration of testosterone to the eugonadal range (3-10 ng/ml) appears to correct impaired sexual function in those men[23]. Digital rectal examination and PSA should be assessed before starting androgen replacement therapy.

## SPECIAL INVESTIGATIONS

These tests should not be done on a routine basis and should be reserved for selected cases when indicated.

### Nocturnal Penile Tumescence and Rigidity (NPTR)

NPTR is used to differentiate between organic and psychological causes of ED (Table 3). NPT is associated with the cycles of REM (Rapid Eye Movement) sleep and is consequently largely unaffected by psychological aspects of ED. NPTR monitoring is done with the Rigiscan® (Fig. 1,2) which records penile tumescence and rigidity at 20-second intervals via transducers placed at the base and the coronal sulcus of the penis.

A Rigiscan is considered normal when the number of erections per night is 4-5 episodes (each lasting at least 10 minutes), an increase in penile circumference of more than 3 cm at the base and 2 cm at the tip and a rigidity of more than 70% at the base and tip[24]. If the Rigiscan is normal, the cause of ED is likely

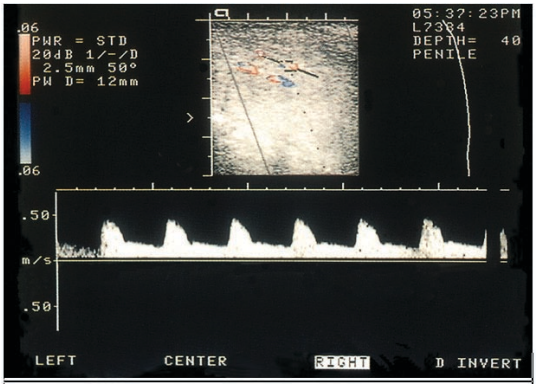


**Fig. 3:** Penile duplex ultrasound.

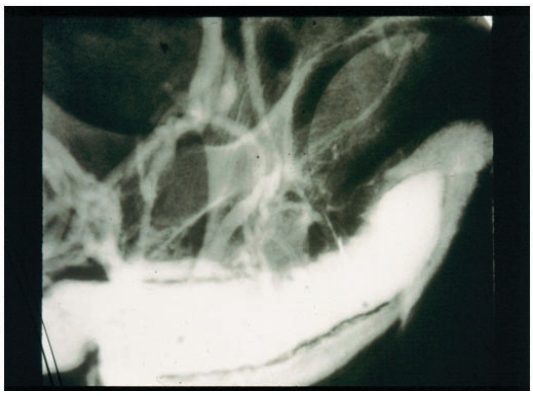

**Fig. 4:** Cavernosography

to be psychogenic. It is important to make sure that the patient actually slept during the session, as any sleep disturbance will cause abnormal Rigiscan readings.

It is also suggested that in young men with organic ED who initially fail to respond to PDE5 inhibitors, NPTR testing be done first without a PDE5 inhibitor and then repeated with a PDE5 inhibitor. If the results with a PDE5 inhibitor are normal, then the patient is not responding to PDE5 inhibitors when he is awake due to concomitant psychogenic causes[25].

**Intracavernosal vasoactive drug injection and penile duplex ultrasound.**

This test helps in evaluating the vascular status of the penis, i.e. the arterial blood flow and the veno-occlusive mechanism of the penis[26]. The pharmacologically induced erection will also reveal any penile deformity, e.g. Peyronie's disease and congenital penile curvature. The ultrasound will further identify plaques or fibrosis.

First PGE1 is given by intracavernosal injection into the base of the penis to induce an artificial erection. PGE1 has the advantage of a low risk of priapism (0.5-1%)[27] and is given at a dose of 5-20 µg depending on the possible etiology, i.e. in patients with a possible neurogenic cause a low dose is used to minimise the risk of priapism, while a high dose is administered in patients with a severe organic pathology, such as uncontrolled diabetes[28]. Further re-dosing can be done to ensure complete relaxation of the corporal smooth muscle and arterial relaxation[29].

Duplex ultrasound scanning is then done to identify penile tissue echogenicity, the cavernous arterial diameter before and after injection, the peak systolic arterial velocity (PSV), the end diastolic arterial velocity (EDV) and the index of vascular resistance (RI) (Fig. 3). A PSV >35 cm/sec and an EDV <5 cm/sec are considered normal values. If the PSV is <25 cm/s then this indicates a severe cavernous arterial insufficiency, while a PSV of 25-35 cm/s indicates a borderline penile arterial flow. An EDV >5cm/s and an RI <0.8 with normal PSV signifies pure veno-occlusive dysfunction, however false positive results may occur due to an inadequate administration of vasoactive substance or patient anxiety which leads to incomplete relaxation of the cavernosal smooth muscle[30,31].

**Cavernosography (Fig. 4)**

This test is indicated in young men with primary ED with a duplex ultrasound diagnosis of veno-occlusive dysfunction. It is valuable when it demonstrates an isolated leakage or

an abnormal venous communication that can be treated with venoligation surgery.

Using an aseptic technique, PGE1 is injected intracavernosally. Two butterfly needles are inserted into the penis: one is used as a pressure manometer and the other is used to infuse saline with an increasing flow at 20 ml/min intervals to develop an erection with a cavernous pressure of 150 mmHg. The fall in this pressure over a 60-second period is measured. The infusion is then restarted and the flow rate necessary to maintain erection with a cavernous pressure >100 mmHg is recorded. Then 50-100 ml of radiographic contrast is instilled to demonstrate the corpora cavernosa and show the venous systems.

The maintenance flow rates should be less than 5 ml/min and the normal pressure decline should be less than 45 mmHg in 30 seconds[32].

However, the use of this test has decreased, because it assumes smooth muscle relaxation and because the results of and indications for venous ligation surgery are being questioned.

## Internal pudendal arteriography

This test is indicated in young men <50 years in whom penile duplex ultrasound demonstrates penile arterial insufficiency in the absence of any risk factors for vascular disease. It is of value when it shows an isolated arterial occlusion due to pelvic or perineal trauma that can be treated by penile revascularization surgery[33]. Penile angiography may also be used in high-flow priapism prior to embolization where it may demonstrate an arterio-venous fistula[34].

## Nerve Studies

### Biothesiometry:

Vibratory stimulation is applied to the penis with a gradual increase in frequency until the patient reports feeling the stimulus in order to measure the sensory perception in the penis[35].

### Bulbocavernous reflex latency time (BCR) and somatosensory evoked potentials (SSEP):

This is a test for penile sensation. Normally, electrical stimulation of the penile shaft leads to reflex contraction of the bulbocavernous muscle. The bulbocavernous reflex is a spinal reflex (S2-4) with the dorsal nerve of the penis (a branch of the pudendal nerve) as afferent and the motor fibers of the pudendal nerve to the pelvic floor muscles as efferent. A ring electrode is applied to the distal shaft of the penis to provide impulses and 2 needle electrodes are placed in the bulbocavernous muscles to record the response[36]. The somatosensory evoked potential and its latency time are also measured by electrodes placed on the scalp. The interval between the stimulus and the response is calculated, and this interval is the BCR latency time. A BCR latency time > 40-42 msec should be considered pathologic[37].

### Sympathetic skin response (SSR):

The SSR is a sympathetic response in the form of sweat gland secretion accompanied by an electrical potential in response to a skin stimulus, i.e. the afferent is a somatic nerve and the efferent is a sympathetic nerve. SSR of the penis can be used to diagnose autonomic neuropathy of the cavernosal autonomic nerves[38]. The normal latency time for the SSR is between 1100-1600 msec[39]. Simpler tests include detecting a change in heart rate in response to penile sensory stimulation.

## CONCLUSION

With the wide variety of ED therapeutic options available, it is important to remember that a good medical and psychosexual history, physical examination and basic laboratory investigations are effective in diagnosing ED in most patients. Furthermore, they can

demonstrate systemic disturbances that predispose to cardiovascular disease. Other investigatory modalities should be reserved for selected cases.

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