

## **How do erections occur? How common is erectile dysfunction, what is its etiology, and how do you evaluate men with this problem?**

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### **How do erections occur?**

Penile erection requires elaborate orchestration of neural, vascular and hormonal processes in the proper psychological setting. The function occurs with the filling of the corpora cavernosa, spongy vascular chambers of the penis, with blood to create a rigid organ usable for sexual intercourse. Erections are initiated and maintained by two main processes: relaxation of the arteries of the corpora cavernosa to allow increased inflow of blood, and increased resistance of outflow venous channels to maintain tumescence. Increased resistance to outflow is a passive process – the venous channels are compressed against the tunica albuginea by the expanding penile tissue. The increased inflow is a complicated neurohormonal process, whereby messenger molecules (nitric oxide, cGMP, cAMP, and others) released by local neurons lead to smooth muscle relaxation, arterial dilation and increased blood flow.

### **How common is erectile dysfunction?**

Erectile Dysfunction (ED) is defined as “the inability to attain and/or maintain penile erection sufficient for satisfactory sexual performance.” (AUA Guidelines, 2005) The prevalence of ED increases with age. For men less than 40 years old, the worldwide rate of ED ranges from one to nine percent. For men in their sixties, rates vary from 20 to 40%. As much as 50 to 75% of men in their 70’s and 80’s will have ED. In the US, it is estimated that over 600,000 men each year will develop ED. The risk of ED increases with diabetes mellitus, heart disease, and hypertension.

### **What is its etiology?**

Erectile dysfunction can manifest in many ways and have many physiologic causes. Patients may be unable to achieve a complete erection, or to maintain the erection; they may have pain with erections or changes in erogenous penile sensation. These problems may be caused by dysfunctional neurons that carry messages to the penis, or there may be an

inability of the blood vessels to deliver adequate blood flow to create an erection.

The causes of ED form five specific categories: (1) vasculogenic, due to either arterial or venous problems, (2) neurogenic, (3) endocrinologic, (4) related to medications or (5) psychogenic. The most common etiology of ED is by far vasculogenic, with venogenic (cavernosal) causes believed to be slightly more common than arteriogenic causes. Vasculogenic etiologies can be related to cardiovascular disease, like atherosclerosis, that leads to arterial insufficiency or degenerative changes of the fibroelastic tissue of the penis. Neurogenic causes, that are estimated to make up 10 to 19% of ED, may be related to neurological disease (like multiple sclerosis) or result from physical damage to nerves either during pelvic surgery or from traumatic injuries to the pelvis. Endocrinologic causes of ED are rarer; however, thyroid hormone or sexual hormone abnormalities are more common in patients with ED than they are in the general population. Many cases of ED are medication-related. The most common culprits are anti-hypertensive medications, especially beta-blockers, that lead to decreased blood perfusion to the penis for erection to occur. Other medications, including many classes of psychiatric medications and medications that reduce male sexual hormones (i.e. testosterone) are related to ED. Psychogenic causes are believed to play a role in up 90% of ED (often combined with another etiology). The most common psychogenic causes are depression, anxiety, and stress, although many psychiatric disorders can contribute to ED. Many disease states that are related to ED can have more than one categorical etiology. For example, diabetes mellitus can contribute to both vasculogenic and neurogenic dysfunction that can hinder the ability to achieve erection.

### **How do you evaluate men with this problem?**

In addition to eliciting details regarding the etiology of ED, it is important to understand if the ED is a problem of physical function (erections do not occur or are unsatisfactory) versus performance (erections can be achieved but not during sexual stimulation). The functional types can be thought of as organic ED versus psychogenic ED; organic ED refers to a physical aberration that prevents the achievement of a functional erection, and is usually vasculogenic, neurogenic, endocrinologic in nature, or medication-related. In the absence of these conditions, psychogenic ED may be inferred. Etiologic and functional classifications of ED are demonstrated in the Fig. 1.

Therefore, the most important measures to evaluate ED are a good history and physical examination. First, understanding the circumstances of the patient's ED can help delineate the type of ED and in some cases the

etiology of ED. Important details of the sexual history specifically regarding erection include the degree of rigidity achieved, the presence of nocturnal or early-morning erections, the ability to have sexual intercourse or masturbate and the presence of any deformities or curvatures of the penis. Questionnaires like the Sexual Health Inventory for Men (SHIM), also known as the International Index of Erectile Dysfunction, 5-item version (IIEF-5), are standardized tools used by physicians to understand and rate the severity of each patient's ED. In general, high scores indicate normal erectile function while lower scores indicate worsening degrees of ED.

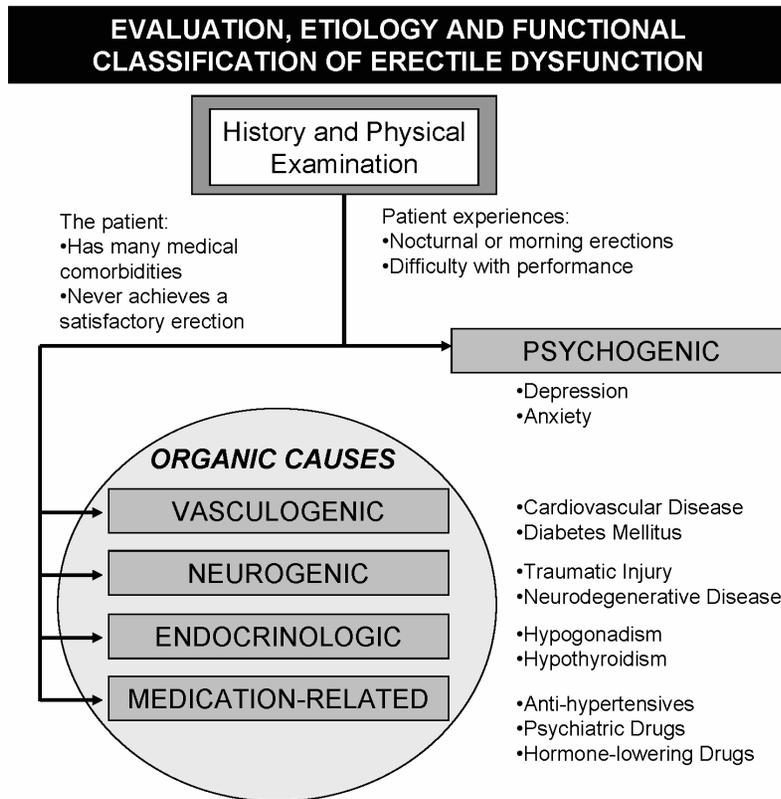


FIG. 1. Evaluation, Etiology and Functional Classification of Erectile Dysfunction (ED). Common examples of disease states in each category are listed adjacent to each.

Many of these details can help the evaluating physician discern between organic and psychogenic types of ED. Once it is clear (or highly suspicious)

that an organic type is responsible for ED, it is important to ascertain the patient's medical comorbidities, medical and surgical history, and medications. By capturing these details, physicians may find correctable causes of ED. For example, a patient whose ED coincides with starting metoprolol (a common anti-hypertensive medication) may warrant a trial of new medication to control his blood pressure. Additionally, it is extremely important to assess each patient's risk factors for cardiovascular disease. These risk factors include older age, hypertension, hyperlipidemia, diabetes mellitus, obesity, cigarette smoking and a sedentary lifestyle. By determining the presence of these factors, which are potentially modifiable, patients can make changes that can improve their erections and decrease their risk of having a cardiovascular event (heart attack or stroke) in the future. Interestingly, recent data have demonstrated that ED may be an early sign and risk factor for cardiovascular disease.

Physical examination should involve a thorough inspection of the genitalia for deformities that may contribute to ED. Peyronie's Disease for example is a curvature of the penis that is associated with ED. A small or non-present testis or testes may be indicators of hypogonadism. In addition, a thorough vascular and neurological examination including peripheral pulses and reflexes may suggest vasculogenic or neurogenic causes of ED.

Once a thorough history and physical examination are completed there are many laboratory and physiological tests that can be performed to measure the degree of ED and delineate certain causes of ED. Serum lipid levels and hormone levels can identify many cardiovascular and endocrinologic etiologies of ED. Ultrasound and vascular imaging technologies can identify whether or not there is adequate blood flow to the penis. In general, many evaluations of ED are complete without the need for complicated testing – a thorough history and physical examination are often sufficient before initiating ED treatment.

**Suggested reading**

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