



Sexual dysfunction in the older man is common and has a significant impact on quality of life. In the aging man, erectile dysfunction (ED) has been encountered frequently due not only to associated comorbidities such as heart disease, hypertension, medications, diabetes, smoking, and depression, but also as a result of the aging process itself. Aging may impair molecular and structural components of erectile function. The introduction of effective oral erectogenic drugs has led to increased awareness of sexual issues and advancement in the methods used by clinicians to diagnose ED. Over the last twenty years, the approach for identification and evaluation of ED has transformed from invasive techniques to patient self-reporting and minimally invasive office procedures.

Key words: erectile dysfunction, aging, diagnosis, evaluation.

The Diagnosis and Investigation of Erectile Dysfunction in the Older Man

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Introduction

Erectile dysfunction (ED) has been defined as the consistent or recurring inability of a man to achieve and/or maintain an erection sufficient for satisfactory sexual performance or intercourse.¹ The increasing incidence of ED with age was acknowledged by the NIH Consensus Conference in 1993. The Massachusetts Male Aging Study (MMAS) has also provided a detailed epidemiological report on ED, demonstrating the detrimental role of age on the mechanism of erection.² In this evaluation, men between the ages of 40 and 70 years were asked to categorize their erectile function as totally, moderately, or minimally impotent or potent. Overall, 52% of the people reported certain degrees of ED. Between 40 and 70 years of age, the probability of complete ED tripled from 5.1% to 15%; moderate ED doubled from 17% to 34%; whereas minimal ED remained at 17%. By the age of 70 years, only 32% portrayed themselves as being free from ED.² In aging men, a higher probability of ED has been directly correlated with heart disease, hypertension, diabetes, medications, smoking, and depression.² However, ED may occur frequently in healthy older men around 70 years of age without major comorbidities, in whom an incidence of 25% has been reported.³

The effect of the normal aging process on erectile function is unknown and the cause of age-related dysfunction is likely to be multifactorial in origin.⁴ Alterations in blood vessels, hormonal

changes, neurologic dysfunction, medications and associated systemic diseases seem to be the main causes. Although a multitude of factors contribute to ED associated with aging, the ultrastructural changes to the tunica albuginea and corpora cavernosa play an important role. Penile tissue is composed of smooth muscle cells resting on collagen and elastic fibres limited by the tunica albuginea. Changes in the smooth muscle cells, elastic fibre activity, or collagen fibre content with age may bring about mechanical alterations of the penis by reducing its elasticity and compliance, which prevent optimal function of the corporeal smooth muscle and interfere with the normal filling of the vascular spaces.⁵ In addition, the percentage of smooth muscle cells in the corpora cavernosa declines with age.⁶ These ultrastructural changes in aged men certainly contribute to a decreased cavernous arterial inflow.⁷

Evaluation of ED Patients

Sexual dysfunction in older men is common and has a significant impact on quality of life. The introduction of effective oral erectogenic drugs has led to increased awareness of sexual issues and advancement in the methods used by clinicians to diagnose erectile dysfunction (ED). The last twenty years has seen the approach for identification and evaluation of ED transform from invasive techniques to patient self-reporting and minimally invasive office procedures. These newer strategies have focussed on scales or validated questionnaires that

can be used by both primary physicians and specialists. Occasionally, more specialized methods are used to make a specific ED diagnosis and direct treatment.

Traditionally, sexual medicine has been “disease-centered”; the patient played a passive role and the physician performed a number of relatively invasive tests in order to make a diagnosis leading to treatment. This has given way to a more patient-oriented approach in which the biological aspects as well as the psychological and social implications of the problem are considered. Along these lines, the “goal-directed approach” as described by Lue⁸ similarly focuses on the need to consider patients’ goals and motivations in making diagnostic and treatment decisions before undertaking a detailed and expensive evaluation. This approach has been further revised to simplify the diagnosis in the primary care setting.⁹

Clinical decision making is increasingly reliant on the results of randomized clinical trials, case-control studies, meta-analysis, and systematic reviews. The principles of evidence-based medicine dictate that clinicians must seek information from a number of sources before customizing a diagnosis and treatment plan. Tests or procedures should not be performed without controlled clinical data or research that supports their use. As a rule, costly invasive procedures should be considered experimental.

The overall evaluation of sexual dysfunction includes patient-physician interchange, history taking (medical, sexual, and psychosocial), focussed physical examination, and specific laboratory tests. More specialized tests and referrals need to be considered as one moves down the algorithm for ED evaluation (Figure 1).

Medical and Sexual History

The basic evaluation for ED in the older male should be initiated with a detailed medical history, which is helpful to identify any underlying pathology and ED-associated comorbidities. A thorough medical history should screen for risk factors such as high blood pressure, diabetes mellitus, hypercholesterolemia, cardiovascular disease, depression, atherosclerosis, arthritis, peripheral vascular disease, renal failure, spinal cord injury, endocrine abnormalities, pelvic surgery and trauma, and lifestyle-related risk factors including obesity, alcohol, drug use, and smoking (Table 1).¹⁰ Several medications, such as selective serotonin reuptake inhibitors, diuretics, antihypertensive drugs, and alpha blockers for lower urinary tract symptoms (LUTS), may contribute to ED.¹¹

In many cases, patients may complain of one type of sexual dysfunction (e.g., inability to maintain an erection) and often have additional problems (e.g., lack of desire, orgasmic disorders, or ejaculatory dysfunction). The onus is on the clinician to make the patient comfortable enough to express his concerns and complaints. This demands that the clinician display genuine sensitivity, a non-judgmental attitude, and respect for differences in culture, race, and religious background. Sexual inquiry is commonly done by direct confidential interview with

Table 1: Possible Risk Factors for ED

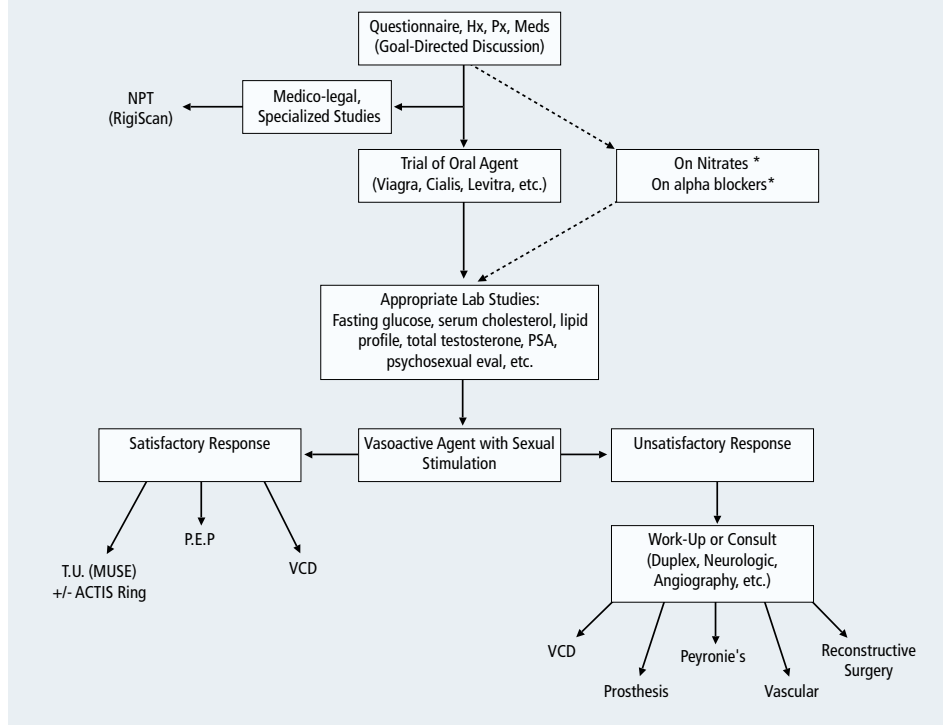
High blood pressure
Diabetes mellitus
Hypercholesterolemia
Cardiovascular disease
Depression
Atherosclerosis
Arthritis
Peripheral vascular disease
Renal failure
Spinal cord injury
Endocrine abnormalities
Pelvic surgery and trauma
Lifestyle factors (e.g., obesity, alcohol, drug use, and smoking)
Medications (SSRIs, diuretics, antihypertensive drugs, and alpha blockers)

the patient and, if possible, the partner in attendance.

The incidence of ejaculatory disorders and alterations in libido in aging men are encountered more often than in younger men, due in part to previous surgeries, medications, hypogonadism, and neurological disorders. Aging males demonstrate a decrease in libido, difficulty in sexual excitability, and reduction of orgasm intensity with reported rates of 20–30%.¹² Although there have not been specific questionnaires published for ejaculatory disorders, a good history often determines useful information regarding force of ejaculation, the amount of ejaculate, and quality of ejaculation. Loss of libido is usually a part of age-related hypogonadism.¹³ The ADAM questionnaire (Androgen Deficiency in the Aging Male), which consists of questions assessing symptoms of hypogonadism, has been used commonly to diagnose age-related decrease in libido.¹⁴ Positive responses, particularly for question 1 or question 3, or any three other questions from the questionnaire are indicative for hypogonadism (see Table 2).

Validated questionnaires are useful assessment tools for ED and can facilitate dialogue with patients, guide the physician to a diagnosis, and evaluate treatment outcomes. The IIEF-5, a self-administered and standardized test, is an abbreviated form of the International Index of Erectile Function.¹⁵ This five-item questionnaire is based on the parameters of erection confidence, erection firmness, maintenance frequency, maintenance completion, and intercourse satisfaction. Furthermore, it quantifies ED severity and monitors effectiveness of ED treatment during follow-up. Basically, the severity of ED is defined by using

Figure 1: Diagnostic Algorithm for ED



SHIM questionnaire scores: normal erectile function (22–25), mild (17–21), mild to moderate (12–16), moderate (8–11), or severe ED (5–7). In contrast, IIEF, a 15-item questionnaire, is based on five domains including erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction.¹⁶ Apart from questionnaires, physicians should also focus on the duration of ED, the nature of onset, questioning the frequency and the quality of morning erections, as well as related psychogenic, cultural, and social factors. The patient needs to be questioned regarding

the nature of past and current partner relationships, marital status, education level, and occupational status.

Depression is an important risk factor for ED in the aging. The prevalence of depression reaches a peak value in the years before retirement, decreases the first 10 to 15 years after retirement, and increases again after age 75.¹⁷ A detailed psychosocial assessment can also illuminate important aspects about sexual dysfunction in the older man. Physicians should not assume that every patient is involved in a monogamous, heterosexual relationship. It is important to note that in many cases organic and psychogenic factors may co-exist, and be related or unrelated to each other. The Beck Depression Inventory and CES-D (the Centers for Epidemiologic Studies-Depression) scales are useful tools to assess patients' depression status.¹⁸ A score equal or less than 14 for the Beck inventory and ≤ 16 score for the CES-D are indicative of the presence of depression.

Recently, the 5th Committee of the World Health Organization Consensus Panel on ED provided a sample of sexual history questions to help clarify the

various aspects of the patient's sexual function.¹⁹

Physical Examination

Although physical examination usually does not identify the cause of ED, the patients should be evaluated with a complete physical examination that includes an assessment of secondary sex characteristics; femoral and lower extremity pulses; a focussed neurologic examination with evaluation of perianal sensation, anal sphincter tone, and bulbocavernosus reflex; an examination of penile vasculature, evaluation of prostate by a digital rectal exam; and evaluation of penis for penile plaques.^{1,9} The presence of a penile plaque may indicate Peyronie's disease, which is often associated with ED. The physical exam additionally assesses the patient's overall health status, may uncover important comorbidities (e.g., diabetes, cardiovascular disease, etc.), and can provide the patient reassurance or further education in regards to lifestyle modification.

Evidence of testicular atrophy, osteoporosis, alteration in body hair distribution or loss, or gynecomastia necessitate a hormonal evaluation. Lower urinary tract symptoms such as frequency of micturition, nocturia, urgency, hesitancy, poor urine stream, post-void dribbling, and urinary incontinence may be associated with ED in the older male. Population based studies demonstrate a frequency of moderate-to-severe LUTS that ranges from eight to 31% in men in their fifties, increasing to 27–44% of men in their seventies.²⁰

Initial evaluation

Basic initial evaluation for ED is aimed at the identification of the underlying pathological condition and ED-associated risk factors. This screening may diagnose reversible causes of ED and unmask medical and psychological conditions that manifest as ED. The recommended initial screening laboratory tests for patients with sexual problems include fasting glucose, serum cholesterol, lipid profile, and a hormonal profile (e.g., total morning testosterone). As with the physical examination,

these tests are performed primarily to exclude specific etiologies (e.g., hypogonadism) and to assess for other comorbidities (e.g., diabetes, hyperlipidemia, etc.). Additional laboratory tests are based on the medical history and clinician's judgment (e.g., prostate specific antigen [PSA], complete blood count [CBC], luteinizing hormone [LH], thyroid stimulating hormone [TSH], prolactin, glycosylated hemoglobin [HbA1c], etc.).

In accordance with the principles of patient-centered and goal-directed sexual medicine, patients (and partners, if possible) should be included in the decision-making process regarding the need for more specialized (invasive) testing. In many cases, these additional diagnostic studies are performed if patients do not respond to an initial trial of a PDE5 inhibitor. These additional tests may be important in regards to alternate treatment options (e.g., vacuum tumescence devices, intraurethral and intracorporal vasoactive agents, psychological counselling, and surgical options).

Free testosterone and only a part of the albumin-bound testosterone are defined as bioavailable. Longitudinal studies have demonstrated that serum testosterone levels decrease with age.²¹ However, bioavailable testosterone declines more steeply than total testosterone due to an age-associated increase in SHBG-binding capacity.²² If a morning total testosterone level is low, bioavailable testosterone and LH levels are evaluated. The decrease in serum testosterone in aged men can result from primary testicular changes, altered neuroendocrine regulation of Leydig cell function and/or an increase in sex hormone binding globulin (SHBG).²¹ Prolactin assessment is also necessary to rule out a pituitary adenoma.²³ For a man over 50 years of age, the PSA value needs to be evaluated annually.²⁴

Advanced Tests

The aim of specialized evaluation is to define the etiology of ED. In many circumstances in sexual medicine, patients can be treated without knowing the exact cause of the sexual dysfunction (e.g., using PDE5 inhibitors). However, in the absence of accurate diagnostic testing, efficacy and overall satisfaction with therapy are left to chance.

In general, indications for specialized vascular evaluation include: failure of initial treatment (e.g., PDE5 inhibitors), Peyronie's disease, primary ED, history of pelvic or perineal trauma, vasculopathy or neuropathy, complicated endocrinopathy, complex psychiatric disorders, relationship problems, and specialized medico-legal concerns. In addition, it may also be important for scientific and clinical reasons in groups of patients with chronic diseases, such as renal failure.²⁵ The most commonly employed (evidence-based) specialized procedures for diagnostic evaluation of ED include: office ICI (intracavernous injection pharmacotesting), penile duplex doppler ultrasonography (PDDU), dynamic infusion cavernosometry and cavernosography (DICC), selective pudendal arteriography, magnetic resonance imaging (MRI) of the penis, nocturnal penile tumescence and rigidity testing (NPTR) in a sleep lab or at home with a RigiScan device, bio-

Table 2: ADAM Questionnaire

Androgen Deficiency in Aging Males (ADAM) questionnaire	
1	Do you have a decrease in libido (sex drive)?
2	Do you have a lack of energy?
3	Do you have a decrease in strength and/or endurance?
4	Have you lost height?
5	Have you noticed a decreased "enjoyment of life"?
6	Are you sad and/or grumpy?
7	Are your erections less strong?
8	Have you noted a recent deterioration in your ability to play sports?
9	Are you falling asleep after dinner?
10	Has there been a recent deterioration in your work performance?
Source: Adapted from Metabolism 2000;49:1239-42, by Morley, et al.©2000, with permission from Elsevier.	

thesiometry (vibratory thresholds), dorsal nerve conduction velocity test, bulbocavernous reflex latency test, and MRI or PET scanning of the brain (Table 3).

Each of these specialized diagnostic methods has pros and cons. They may provide important diagnostic information in some cases, but certainly not in all situations. It is vitally important that the clinician use these ancillary methods in context of the "patient-centred" approach. In many situations, sexual medicine is still more of an art than a science.

Table 3: Specialized Procedures for Diagnostic Evaluation of ED

Office ICI (Intracavernous Injection pharmacotesting)
Penile Duplex Doppler Ultrasonography (PDDU)
Dynamic Infusion Cavernosometry and Cavernosography (DICC)
Selective pudendal arteriography
Magnetic Resonance Imaging (MRI) of the penis
Nocturnal Penile Tumescence and Rigidity testing (NPTR)
Biothesiometry (vibratory thresholds)
Dorsal nerve conduction velocity test
Bulbocavernous reflex latency test
MRI or PET scanning of the brain

Diagnosis of Erectile Dysfunction

Among the advanced tests indicated above, PDDU is one of the best methods for evaluating penile arterial status and veno-occlusive dysfunction in the elderly. PDDU provides more objective evaluation and is still minimally invasive.²⁶ Although intracavernosal vasoactive agents such as prostaglandin E1 and papaverine have been used commonly for vascular assessment of ED, the combination of oral sildenafil citrate in association with visual sexual stimulation has recently been demonstrated to be an effective alternative non-invasive pharmacological erection induction method for the purpose of PDDU evaluation.²⁷ A variety of methods have been used to maximize the response during PDDU including manual and visual sexual stimulation. The parameter that is most commonly used to define arteriogenic ED is a peak systolic velocity (PSV) in the penile arteries of less than 25 cm/s.²⁸ PSV greater than 35 cm/s is indicative of normal arterial flow. End diastolic velocity (EDV) greater than 5 cm/s and resistive index (RI) less than 0.8 documents veno-occlusive dysfunction. A negative correlation between age and PSV has been demonstrated.²⁹

Conclusion

With the introduction of effective oral treatments for ED, diagnostic approaches for ED have transformed from invasive to more non-invasive in nature. Validated self-assessment questionnaires give detailed information about the patient's sexual function. Basic initial evaluation of ED in the aging is aimed at the identification of the underlying pathological condition and ED-associated risk factors. The recommended initial screening laboratory tests for patients with sexual problems include fasting glucose, serum cholesterol, lipid profile, and morning testosterone assessment. As with the medical history and physical examination, these tests are performed primarily to exclude specific etiologies and to assess for other comorbidities. Advanced diagnostic testing should be

reserved for patients who do not respond to medical ED therapies or are candidates for surgical intervention. ♦

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