Erectile dysfunction has been poorly recognized and managed in the past, due to its taboo aspects and erroneous perceptions of its medical significance. With research, improved understanding has guided a practical approach to its diagnosis and treatment. In most presentations, erectile dysfunction has an organic aetiology. Likely causes are often discerned from the clinical history and physical examination. Management may be a simple matter of addressing correctable risk factors, or a direct intervention may need to be pursued. For an individual patient, selection of the 'ideal' treatment is based on an understanding of the extent of the problem and consideration of the patient's preferences.

Erectile dysfunction is commonly referred to as impotence, is defined as the consistent inability to attain and maintain penile erection sufficient to permit satisfactory sexual intercourse. This problem affects approximately 30% of all men between the ages of 40 and 70 and occurs most often in men older than age 65.

Erectile dysfunction carries the implication of sexual failure and is associated with anxiety, depression, marital discord, and even violence. Yet, remarkably, less than 1% of affected men seek professional treatment. Many men with this medical condition mistakenly believe:
- matters relating to sexual dysfunction are taboo
- loss of erections is not a common problem, and their problem is unique
- erectile dysfunction is a normal part of ageing
- inability to achieve erections is primarily a psychological problem and not physical one
- treatment options are generally lacking or are too invasive and risky to be pursued.

The purpose of this review is to help primary care practitioners dispel these common misconceptions by identifying and educating the patient with erectile dysfunction, performing a basic diagnostic evaluation and implementing effective treatment. Contemporary treatment options, including new oral agents, are described.

Physiology of erection

Penile erection is fundamentally a haemodynamic process involving increased arterial inflow to the penis, penile engorgement with blood, and decreased venous outflow from the organ, regulated by nervous system control.

In the flaccid state, the penis is tonically contracted, and little blood circulates within its relatively constricted vasculature. The sympathetic component of the autonomic nervous system regulates this function. Penile erection, conversely, involves arterial dilation and corporal smooth muscle relaxation, which facilitates blood filling. At the distensibility limit of the tunica albuginea that surrounds the erectile tissue, venous outflow is restricted and rigidity occurs. This function involves activation of the parasympathetic component of the autonomic nervous system, either from the CNS level (psychogenic erection) or from direct genital tactile stimulation (reflexogenic erection).

A host of chemical factors contributes to the erectile process, including hormones, neurotransmitters, and substances locally released from the endothelial or smooth muscle components of the erectile tissue. Recently, the principal mediator was identified as nitric oxide, released from nerve endings and vascular endothelium. Knowledge of the effect of these chemicals has facilitated the development of pharmacological approaches for management of erectile dysfunction.

From a clinical perspective, various diseases, injuries and drugs have been associated with erectile dysfunction (Table 1). It has also been suggested that there may be a gradual loss of erectile tissue integrity with ageing that is unrelated to other medical problems. Many experts now believe that in as many as 80% of men with erectile difficulty there is an organic basis; that is, the dysfunction pertains to alterations in the neurological, vascular, and end-organ requirements for normal penile erection.
Many experts now believe that in as many as 80% of men with erectile difficulty there is an organic basis...

**Diagnosis**

**How extensive the evaluation?**

Overall, the diagnostic evaluation for erectile dysfunction should be performed to facilitate recommendations for treatment. The basic clinical evaluation should be individualized, without being unnecessarily costly or invasive. Its initial goal should be to identify risk factors that may be immediately addressed. The evaluation should also provide a general sense of the severity of the erectile dysfunction, which would guide the selection of successful treatments.

Minimally invasive treatment options may be selected without discriminating the exact origin of the erectile dysfunction, and more extensive diagnostic testing may be unnecessary. However, a patient with erectile dysfunction who desires a more invasive treatment option should probably be referred to a urologist who specializes in erectile dysfunction for additional diagnostic testing. The intended scope of this review does not allow a more complete discussion of specialized testing modalities.

Components of the basic evaluation for all patients with erectile dysfunction are: sexual function history (patient and partner), general medical and psychosocial history, drug history, physical examination and basic laboratory testing. For selected patients, the evaluation may include specialized hormonal, neurological and vascular testing.

**Sexual function history**

Begin the evaluation with a comprehensive sexual function history (Table 2). Among clues that the erectile dysfunction has an organic basis are reports that the difficulty followed a physical trauma of the pelvic region, erections deteriorated gradually over an extended period of time, maintenance of erections is consistently poor, and erections are not observed upon awakening.

*In the flaccid state (top), little blood circulates within the constricted vascularature of the penis. Erection (centre) involves arterial dilation and smooth muscle relaxation, which facilitates blood filling. At the distensibility limit of the tunica albuginea (bottom), venous outflow is restricted and penile rigidity occurs.*

Illustration by Ron Boisvert.
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References: 1. Data on file - Janssen-Cilag Reg. Details 250 μg 32/7.1.5/0490, 500 μg 32/7.1.5/0491. 1000 μg 32/7.1.5/0491 - Janssen Pharmaceutica (Pty) Ltd Reg No: 80/11122/07 - P.O. Box 783939, Sandton 2146 or 15th Road, Halfway House 1685 - Tel (011) 269 4600
Erectile dysfunction
continued

_Probe for past medical conditions that may be causative factors for erectile dysfunction._

**Medical history**
Take a standard medical history, which includes aspects of medical and surgical history. Probe for past medical conditions that may be causative factors for erectile dysfunction. Ask the patient about potential stresses, interpersonal relationship problems, and affective disorders (e.g., depression) that may be associated with sexual dysfunction.

**Drug history**
Medications are estimated to play a role in up to 25% of cases of erectile dysfunction. The actual percentage may be significantly greater, assuming that many patients using medications that alter erectile function do not seek evaluation and the problems for which the drugs are prescribed may themselves be associated with sexual and erectile dysfunctions.

Drugs may affect erectile function by impairing control mechanisms involved in the physiology of penile erection. Potentially adverse prescription drugs include psychotropic agents (neuroleptics and antidepressants), cardiovascular agents (vasodilators and diuretics), antiandrogenic agents and drugs with antiandrogenic effects (certain antacids), and anesthetics of the nonsteroidal anti-inflammatory type. Nonprescription drugs with adverse effects on erections include alcohol, cigarettes, narcotics and other illicit substances.

**Physical examination**
The physical examination begins with careful attention to masculine and genital development, genital anatomy and neurological and vascular functioning. Examination of the penis may reveal deformities such as micropenis, chordee (painful erection), typical of hypospadias, or Peyronie's disease (fibrous plaques in the corporea cavernosa that result in distortion or deflection of the erect organ).

The absence of abnormalities of position, size and consistency of the testes may suggest alterations of the sex steroid hormonal system. Neurological examination, including evaluation of genital and perineal sensation and the bulbocavernous reflex, may reveal a neuropathic reason for erectile dysfunction. A basic cardiovascular examination including blood pressure and peripheral pulses may indicate a vascular cause.

**Laboratory tests**
A basic laboratory investigation is a reasonable component of the initial evaluation. The objective is to explore whether known or previously undiagnosed medical illnesses may be contributing to the erectile disorder. In some instances, a routine urinalysis may reveal abnormalities such as glycosuria and proteinuria, whereas routine blood count and chemistries may detect common metabolic disorders such as diabetes mellitus and renal insufficiency.

The value of routine endocrinological testing remains controversial. The incidence of endocrinopathy in patients presenting with erectile dysfunction may be only 2%. Furthermore, it is probable that the endocrinopathy pertains more to decreased libido than to erectile dysfunction. However, because some men benefit from hormonal replacement therapy, at least a basic evaluation should be considered.

It may be difficult to determine that a patient has treatable hypogonadism on the basis of decreased libido, presence of bilateral testicular atrophy, or other clinical grounds. A reasonable recommendation to evaluate for this possibility is to obtain a morning-time serum total testosterone level. If an abnormal level is found, additional testing to include a serum prolactin level and measurement of serum gonadotropins.
Referral for sex therapy or counselling may be useful for both organic and psychogenic erectile dysfunctions, even if a physical intervention is planned.

### Table 2

#### Erectile problems: comprehensive sexual function history

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>SPECIFIC QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset, duration, evolution of erectile dysfunction</td>
<td>Gradual or sudden?</td>
</tr>
<tr>
<td>Type of dysfunction</td>
<td>Failure to attain or maintain erection?</td>
</tr>
<tr>
<td>Current quality of erections</td>
<td>Sufficient for sexual intercourse:</td>
</tr>
<tr>
<td></td>
<td>Under certain circumstances?</td>
</tr>
<tr>
<td></td>
<td>With certain positions?</td>
</tr>
<tr>
<td>Stimulus for achievable erections</td>
<td>Sexual encounters?</td>
</tr>
<tr>
<td></td>
<td>Self-stimulation?</td>
</tr>
<tr>
<td></td>
<td>On awakening?</td>
</tr>
<tr>
<td>Sexual issues distinct from erectile dysfunction</td>
<td>Libido</td>
</tr>
<tr>
<td></td>
<td>Ejaculation</td>
</tr>
<tr>
<td></td>
<td>Orgasm</td>
</tr>
<tr>
<td>Other issues</td>
<td>Availability, interest, health of partner</td>
</tr>
<tr>
<td></td>
<td>Changes in medical status or other events relating to onset of dysfunction</td>
</tr>
<tr>
<td></td>
<td>All prior attempts to manage the problem by the patient or another caregiver</td>
</tr>
</tbody>
</table>

Source: Prepared by Arthur L Burnett, MD.

(luteinizing hormone, follicle-stimulating hormone) is then warranted to exclude a prolactin-secreting tumour or other abnormality of the hypothalamic-pituitary-gonadal axis. Thyroid function tests may be done if suspicions are high for thyroid disease based on clinical presentation.

Only men with clearly documented hypogonadism should be considered as candidates for hormonal replacement therapy. It is critical that a PSA level and digital rectal examination of the prostate have been done to evaluate possible prostate disease that might be stimulated by exogenously administered testosterone.

### Principles of treatment

Treatment of the patient with erectile dysfunction is based on the findings of the clinical evaluation. For example, begin efforts to treat any medical conditions associated with erectile dysfunction. Change any prescription medications with adverse effects on erectile function, and encourage patients to quit smoking.

The contribution of emotional factors should not be underestimated. Referral for sex therapy or counselling (optimally, for the patient and his partner) may be useful for both organic and psychogenic erectile dysfunctions, even if a physical intervention is planned.

Several physical interventions are now available, and a perspective of them should be presented to the patient completely and impartially. The efficacy and complication profiles as well as the expected level of patient involvement of each treatment option should be discussed. In some instances, an option may be considered regardless of the physical cause for erectile dysfunction. In others, an option directed towards the exact underlying physical cause may be more successful. Patient satisfaction is the ultimate goal of treatment, so patient preferences should be solicited.

Treatment categories include vasoactive pharmacotherapy, erection devices, penile prosthesis surgery, and penile vascular surgery (Table 3). The present discussion focuses largely on the expanding role of nonhormonal pharmacological therapies for erectile dysfunction. These include oral, intraurethral and intracavernosal treatments.

### Oral pharmacotherapies

Several oral therapies are used to treat erectile dysfunction, with varying degrees of patient satisfaction.

**Yohimbine**

An alpha-2 adrenoceptor (sympathetic) antagonist, has been touted as an effective aphrodisiac since the turn of the century. Recent studies indicate its primary efficacy may be for patients with psychogenic erectile dysfunction. Given on a trial basis of one month at a dosage of 5.4mg tid, it is generally well-tolerated as a first-line treatment. Potential side-effects are mild blood pressure elevations, palpitations, nervousness and irritability.

**Trazodone HCl**

Trazodone also is a potential first-line therapy. This antidepressant has facilitatory actions on central serotonin and dopamine pathways as well as adrenoceptor antagonistic effects at the level of the erectile tissue. It appears to have its greatest effects on nocturnal erections and probably represents another alternative for men with psychogenic erectile dysfunction.

A dosage range of 50 to 200 mg/d (most commonly 100mg at bedtime) has been used, with eval-
Sildenafil has been shown to be well tolerated and highly effective. A dosage ranging from 25 to 100mg has been used, taken about one hour before anticipated sexual activity.

**TABLE 3**

Quick reference of treatment options for the patient with erectile dysfunction

<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex therapy/counselling</td>
<td>Noninvasive</td>
<td>Indefinite timeframe and cost</td>
</tr>
<tr>
<td></td>
<td>Addresses psychological conditions</td>
<td>Variable success rates</td>
</tr>
<tr>
<td></td>
<td>May apply, regardless of cause of dysfunction</td>
<td>Highly dependent on patient (and partner) co-operation</td>
</tr>
<tr>
<td>Oral medications (yohimbine, trazodone)</td>
<td>Appealing</td>
<td>Limited efficacy to date</td>
</tr>
<tr>
<td>(Sildenafil: see below)</td>
<td>Role in psychogenic dysfunction</td>
<td>Uncertain 'on-demand' use</td>
</tr>
<tr>
<td>Intracavernosal therapy</td>
<td>Effective</td>
<td>Technique-dependent</td>
</tr>
<tr>
<td></td>
<td>On-demand use</td>
<td>Unappealing to some patients</td>
</tr>
<tr>
<td>Intrarectal therapy</td>
<td>Minimally invasive</td>
<td>Technique-dependent</td>
</tr>
<tr>
<td></td>
<td>Moderate efficacy</td>
<td>Local side-effect risks</td>
</tr>
<tr>
<td></td>
<td>On-demand use</td>
<td>Considerable cost</td>
</tr>
<tr>
<td>Vacuum/constriction devices</td>
<td>Relatively safe</td>
<td>Technique-dependent</td>
</tr>
<tr>
<td></td>
<td>Highly successful 'erection-like state'</td>
<td>Cumbersome</td>
</tr>
<tr>
<td>Penile prosthesis surgery</td>
<td>Effective</td>
<td>Invasive</td>
</tr>
<tr>
<td></td>
<td>Simple</td>
<td>Complication risks</td>
</tr>
<tr>
<td></td>
<td>Convenient</td>
<td>Significant cost</td>
</tr>
<tr>
<td>Penile vascular surgery</td>
<td>Corrects 'discrete' vascular lesion</td>
<td>Invasive</td>
</tr>
<tr>
<td></td>
<td>May preserve natural erections</td>
<td>Complication risks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Significant cost</td>
</tr>
<tr>
<td>Hormonal replacement therapy</td>
<td>Minimally invasive</td>
<td>Limited indications</td>
</tr>
<tr>
<td></td>
<td>May improve libido</td>
<td>May promote prostate disease</td>
</tr>
</tbody>
</table>

Source: Prepared by Arthur L Burnett, MD.

Evaluation of success after a one month trial. Potential side-effects of drowsiness, irritability and rarely priapism have been noted.

**Sildenafil**

Phosphodiesterase inhibitors, such as sildenafil, have received intense recent interest. These agents have been shown to prevent the inactivation of potent second messenger molecules involved in the smooth muscle relaxation of erectile tissue. Thus, the medication enhances the normal sexual response.

Sildenafil has been shown to be well tolerated and highly effective. A dosage ranging from 25 to 100mg has been used, taken about one hour before anticipated sexual activity. No more than one dose per day is recommended. Rare, mild and transient side-effects of headache, indigestion, facial flushing and visual abnormalities have been reported.

(P(Sildenafil is absolutely contraindicated in patients who use nitrates, such as those suffering from angina. It is suggested that a full health assessment is made of all potential candidates prior to prescription.)

**Investigational agents**

New oral therapies are emerging with expectations of improved efficacy and patient satisfaction rates. L-arginine, recognized as the precursor amino acid that releases the erectogenic chemical nitric oxide, is being investigated in preliminary trials. Apomorphine, a dopaminergic agonist administered by a buccal formulation, has been shown in preliminary trials to be an effective treatment primarily for men with psychogenic erectile dysfunction. Limitations include the potential side-effects of hypotension, nausea and vomiting.
Erectile dysfunction should no longer be considered an uncommon, medically insignificant problem with few options for treatment.

Phentolamine, an adrenoceptor antagonist, has been used recently on an experimental basis, but like yohimbine it may best apply to patients with psychogenic dysfunction.

Local pharmacotherapies

Intracavernosal
Intracavernosal or ‘penile injection’ therapy has been available for fifteen years and is the ‘gold standard’ of the pharmacological treatment options. Patients using this therapy insert a small needle into the side of the penis for injecting vasoactive medication. Various vasoactive agents have been applied, including prostaglandin E₁ (alprostadil), papaverine and phentolamine. These drugs can be used as monotherapy or in combination, with the expectation of producing a satisfactory, functional erection in approximately 90% of patients.

Dosages are titrated in the practice setting to achieve erectile rigidity sufficient for sexual intercourse, with detumescence occurring within one hour following injection. Potential side-effects of major concern are priapism and penile fibrosis. These occur least often (in about 2% of patients) with injections of prostaglandin E₁, compared with other vasoactive agents. Prostaglandin E₁ is therefore preferred as initial monotherapy, although it has been associated with penile pain — even to a mild degree — in up to 50% of patients. Because these local complications, as well as trauma and haematomas, may potentially occur with intracavernosal pharmacotherapy, doctors instituting this care must be prepared and able to manage them promptly and effectively.

Intraurethral
With the relatively new option of intraurethral treatment, patients insert an applicator into the distal urethra to deliver a suppository of vasoactive medication. Intracavernosal prostaglandin E₁ (alprostadil [MUSE]) is formulated in four standard dosages, from 125 to 1000mcg. Dosage is selected based on the extent of the patient’s erectile dysfunction and his response to in-practice titration.

Clinical trials using this formulation have suggested the efficacy to be in the range of 65-69%* for all causes of erectile dysfunction. Local discomfort associated with the metabolism of the medication occurs in approximately one-third of all patients, whereas minor complications of urethral bleeding, dizziness, and hypotension have been noted on the order of 3 to 4%.

Priapism has been reported in less than 0.1% of patients. Complications are generally minimal, including penile oedema and ecchymosis, but they are generally avoidable with good technique.

Penile prosthesis surgery
Surgical implantation of a semi-rigid malleable or hydraulic inflatable device into the penis represents a more invasive treatment option for erectile dysfunction. Because of the success of alternate therapies, the role of penile prostheses has waned in recent years. Penile prosthesis surgery is generally indicated for presentations involving diffuse haemodynamic dysfunction of the penis or following failure of less invasive treatment options. Diagnostic confirmation is highly recommended prior to proceeding with this form of therapy. It is understood that penile prosthesis surgery is irreversible, as other alternatives cannot be offered subsequently.

Implantation success rates are noted in approximately 95% of cases, with an 85% patient satisfaction rate. Causes for failures include prosthesis malfunction (5%), infection (2%) and erosion (2%).

Penile vascular surgery
This treatment option, which includes both arterial revascularization and venous ligation procedures, is considered investigational. Patient selection is critical for success. The optimal candidate is the young trauma patient with a clearly documented vascular lesion. Individuals with systemic vascular disease are considered to be poor candidates.

Conclusion
Erectile dysfunction should no longer be considered an uncommon, medically insignificant problem with few options for treatment. Recognition of the problem and identification of its risk factors...
More complicated treatments, however, will likely remain under the domain of the erectile dysfunction specialist.

are the first steps in management. All clinicians should be competent in performing a basic evaluation for erectile dysfunction and in discussing treatment options. Include the patient as a participant in the diagnostic and therapeutic process, and give him realistic expectations.

For initial treatment, minimally invasive options such as intracavernosal or intraurethral pharmacotherapies or use of vacuum/constriction devices are generally preferred, even though they require greater patient involvement and have perceptibly lower treatment efficacies. More invasive treatment options such as penile prostheses or vascular surgeries are generally more efficacious, but may pose greater complication risks. Conceivably, cause-specific treatments can be expected to yield the best outcomes. As the minimally invasive options may not require the special expertise of a urologist, primary care practitioners can assume a more active role in managing patients who have erectile problems. This role is likely to be further expanded with the availability of effective oral therapies. More complicated treatments, however, will likely remain under the domain of the erectile dysfunction specialist. With this collaboration dedicated to the proper treatment of men with erectile dysfunction and their partners, this medical condition will no longer remain undertreated.

Staph aureus is the most common pathogen in body-piercing infections

Doctors are being reminded to keep an eye out for infections and other complications of body-piercing. A review of the literature by American physicians has revealed that most reports of infections involved ear piercing. However, the after-effects of piercing the nose, tongue, nipples, navel and genitals are likely to become more apparent as time goes on.

Staphylococcus aureus infection was the most common complication of piercing. In one report, S. aureus showed up in three patients whose pierced ears had become inflamed. Another study reported that it was the predominant organism recovered from a group of girls who held a piercing party. There were several reports of Pseudomonas aeruginosa infection when ear piercing involved the auricular cartilage. Also reported with some frequency were B-haemolytic streptococci infections. Other bacteria (ie primary tuberculosis) have the potential to be inoculated at piercing sites.

Piercing has also been linked to viruses. Transmission of hepatitis B virus has been well documented in cases in which needles and other equipment have been shared. A large, retrospective Italian study found a significant association between ear piercing and hepatitis, even when controlling for IV drug use and promiscuity. And a case-control study in the state of Washington found that those who had hepatitis B were significantly more likely than controls to have had an ear pierced.

The authors add the alarming observation that although no cases were reported, it is possible for HIV to be transmitted through unsterile piercing tools. Reputable piercers follow a strict protocol. Perhaps legislation that has been enacted in several American states to require practitioners to comply with minimum health and safety guidelines, pay licensing fees, and submit to inspections and fines will reduce the potential for complications.