

# Up-to-date on erectile dysfunction and treatment

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## Summary

Erection is a haemodynamic event that involves the central nervous system and local factors and is the recurrent or persistent inability to achieve and or maintain an erection to allow satisfactory intercourse.

The ED is a disease of great social impact: it is estimated that in Italy, 11-13% of men, or about 3 million are affected in part by ED.

Main risk factors are: age, education level, anxiety, reactive depression, diabetes, heart disease, high blood pressure; disorders (hepatic failure, chronic renal failure, obesity, dyslipidemia); hormonal disorders (hypogonadism, hyperprolactinemia, hypo/hyperthyroidism); neuropathies (Alzheimer's disease, Parkinson's disease, degenerative diseases); urologic surgery, colorectal and vascular.

Regarding therapy first and most important form of treatment for a patient suffering from erectile dysfunction is to identify and possibly modify or remove all hazardous conditions for sexual health. First line treatments are selective inhibitors of 5-phosphodiesterase; second-line treatments essentially include intracavernous injection of vasoactive substances and third line treatments include revascularization of the penis and prosthesis implants.

## Key words

*Erectile dysfunction • Inhibitors of 5-phosphodiesterase • Intracavernous injection • Revascularization of the penis • Prosthesis implants*

## Incidence and epidemiology

Erection is a hemodynamic event that involves the central nervous system and local factors. It is governed by relaxation of the cavernosal arteries and the smooth muscle of the corpus cavernosum. An adequate blood flow to the penis plays an important role in this process. In the state of flaccidity, the sympathetic innervation produces a tonic contraction of smooth muscles of the arteries and the body, reducing the flow of blood through the artery cavernous in the cavernosal spaces. Psychogenic stimuli central and / or sensory stimuli from the penis increase the activity of parasympathetic and reduce sympathetic activity, it is therefore a relaxation of the smooth muscles in the penis and increases blood flow through the arteries and cavernous helicine arteries. The smooth muscle relaxation increases the distensibility of the cavernous spaces, leading to congestion and erection. The increase in the volume of blood and the compression of the trabecular-smooth muscle issued against the tunica albuginea, relatively rigid, reduces the venous flow in the output (veno-occlusive mechanism). It follows an erection with a certain degree of rigidity

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and decreased blood flow through the cavernous arteries. When he increased sympathetic activity, the tone of the helicine arteries and contraction of the trabecular-smooth muscle we have the detumescence. The blood flows through the arteries and veins of the penis and intracavernous pressure is reduced to the levels prior to the stimulation of the penis returning to the state of flaccidity.

Erectile dysfunction (ED) is the recurrent or persistent inability to achieve and / or maintain an erection to allow satisfactory intercourse. The ED is a disease of great social impact: it is estimated that in Italy, 11-13% of men, or about 3 million are affected in part by ED <sup>1</sup>. Data from studies conducted previously in the United States, concerning the male population between 40 and 70 years, results were even more severe: the presence of ED, from the most mild to the most severe, was detected in more than 50% of the cases <sup>2</sup>.

The increased incidence of impotence with age was noted by Kinsey in 1948, only 1 man in 50 at the age of 40 years was powerless against 1 in 4 men at the age of 65 years. In 1990, Diokno and C. found that 35% of married men aged over 60 years suffer from erectile impotence. In the US data on ED have been obtained through modern technology: the Massachusetts Male Aging Study (MMAS) and the National Health and Social Life Survey (NHSLs). MMAS includes 1709 non-institutionalized men aged between 40 and 70 years old, living in the vast area of Boston, evaluated for the first time between 1987 and 1989 and re-evaluated between 1995 and 1997. The components of this study were included physiological assessments, demographic information and self-assessment of the state of erectile dysfunction. MMAS was the first epidemiological study cross, community, randomized on erectile dysfunction and its psychological and psychosocial aspects in men in the US <sup>2</sup>.

### **Etiopathogenesis and classification**

If in the past the main cause of this disorder was usually sought in the psychic sphere, researches of the past 20 years have made me understand how at least 70% of ED cases due to causes (or concomitant causes) of organic status. At the origin of these organics problems, there may be various conditions such as obesity, sedentary lifestyle, cigarette smoking, excess blood cholesterol, diabetes, chronic intake of different medicines or the consequences of many interventions surgery. It is important to note that sometimes a sudden onset of ED may be a

warning sign for the overall health of the individual. The risk factors are as follows:

- age, education level, diabetes, heart disease, high blood pressure;
- disorders/hepatic failure, chronic renal failure, obesity, dyslipidemia;
- hormonal disorders (hypogonadism, hyperprolactinemia, hypo/hyperthyroidism), anxiety/reactive depression
- neuropathies (Alzheimer's disease, Parkinson's disease, degenerative diseases), urologic surgery, colorectal and vascular.

It has been seen how it (ED) can anticipate, even years, the event of serious cardio-circulatory problems, or may represent the first sign of a latent diabetes or hypertension <sup>3</sup>.

Risk factors:

- age;
- smoking;
- diabetes;
- obesity and dyslipidemia;
- ipertension;
- cardiovascular disease;
- atherosclerosis;
- endocrinopathies (hypogonadism, hyperprolactinemia);
- Chronic systemic fiseases (CRF, liver disease);
- neurological diseases central and peripheral (Parkinson's disease);
- pelvic surgery;
- abuse of alcohol and drugs;
- drugs (antihypertensives, antidepressants);
- Luts/BPH and relative therapies.

Overall, from a point of view etiopathogenetic and pathophysiological, erectile dysfunction may be due to vascular factors (ED arteriogenica or venogenica), neurological, hormonal and/or psychological, as well as to alterations of the pathway of NO/GuanosinMonophosphat (cGMP) or other factors of electrophysiological microregulation. All conditions ultimately become potentially responsible for an imbalance between the process of relaxation and contraction of smooth muscles of the corpora cavernosa <sup>4</sup>.

### **Arteriogenic Erectile Dysfunction**

Follows a deficit of arterial inflow load of the hypogastric artery – cavernous arteries – helicine arteries. Typically it can be observed in case of:

- atherosclerosis and dyslipidemia;
- diabetes;
- pelvic radiotherapy;

- trauma: perineal/pelvic (crural injury and/or pudenda).

### Cavernous or Venogenic

This form of ED finds its moment etiopathogenetic in an inadequate activation of the veno-occlusive mechanism (VOM) of the corpora cavernosa, responsible for the maintenance phase of the erection same. The deficit of the veno-occlusive mechanism at the level of the corpora cavernosa, a conditioning venous leakage, has been described as one of the etiological conditions most commonly associated with vasculogenic forms of erectile dysfunction. A lack of integrity of the veno-occlusive mechanism of the corpora cavernosa, which is responsible for excessive venous outflow, can achieve two fundamental pathophysiological conditions: an incomplete smooth muscle relaxation or to structural abnormalities of the erectile tissue. This type of pathophysiological conditions may occur in anxious subjects, with an excessive adrenergic tone or in patients with inadequate relaxation of neurotransmitters by the parasympathetic nerve endings. Similar cases are found where there is an alteration of functional alpha-receptors as well as other nerve receptors, which leads ultimately to an increase of the basic tone at the level of smooth muscle cells, impairing the relaxation.

### Neurogenic

Issues central and / or pictures of peripheral suffering can affect the appearance of erectile dysfunction as a symptom of nerve conduction deficit, deficit of release of neurotransmitters or neuromodulators.

### Hormonal

Erectile dysfunction may result from alteration of the control mechanisms for hypothalamic-pituitary, of local neuroendocrine control, as well as the lack of a suitable substrate steroid desire to support and mechanism erectogenic.

### Iatrogenic/post-traumatic

May induce the appearance of erectile dysfunction urological surgical procedures, including endoscopic resection of the prostate (TURP), proceedings of laser-ablation therapy or by vaporization of the prostate, radical surgery for prostate cancer or bladder, as well interventions urethroplasty for stenosis in load tract membranous urethral duct. These are supplemented by the surgical oncology, and at the expense of the rectum and pelvis in general. We must not forget the pictures of post-traumatic lesion. The

pathophysiological substrate for the appearance of ED in these cases is likely to be multifaceted. In fact, all these conditions can lead to the development of peripheral neurological disorders (eg, pudendal nerve injury and/or cavernous), deficit of arterial load of the hypogastric artery/arteries cavernous helicine arteries, as well as inadequate activation of veno-occlusive mechanism <sup>2</sup>.

### Psychogenic erectile dysfunction

The psychogenic erectile dysfunction is defined as the persistent inability to achieve or maintain penile erection that they can have sex exclusively or mainly due to psychological factors or interpersonal. This definition has been adopted recently by the International Society of Sexual and Impotence Research (ISSIR) pointed out that three basic concepts:

- the psychogenic erectile dysfunction is a diagnosis of certainty should not be used when it is before a clinical picture fuzzy or unknown;
- psychosocial factors must be identified as the predominant or exclusive of erectile dysfunction in the subject, so patients with a combination of organic and psychogenic factors should be classified as having mixed erectile dysfunction;
- other elements of this refer to the most recent definitions of erectile dysfunction.

The psychogenic erectile dysfunction often coexists with other disorders such as decreased sexual desire (hypoactive sexual desire) and / or major psychiatric disorders, such as anxiety disorders and depression. In these latter cases it is very difficult to make a diagnosis of psychogenic erectile dysfunction and treatment of primary psychiatric disorder exquisitely is indicated as the first step for the care of the patient.

### Diagnosis

As with any medical problem, it is necessary first of all a detailed collection of symptoms and medical history, especially addressed to the identification of possible risk factors for ED (lifestyle, drug use, presence of chronic disease medications, interventions surgical suffered) or significant psychological or relational components which require specialist advice. With regard to the assessment of specific symptoms, particular attention should be placed on the quantification of the disturbance (ED) seeking to clarify the duration and severity (very useful for this purpose will reveal the specific questionnaires that have been validated at international level) will be important to investigate the presence or absence of

spontaneous erections upon awakening, any loss of libido, the occurrence of premature ejaculation.

Physical examination is directed on the apparatus urogenital, endocrine, vascular and neurological systems, will reveal whether there are abnormalities genital, congenital or acquired, of hormonal problems, neurological or prostate disease. It is very important for the specialist, to establish from the outset a good communication with the patient explaining in detail the following diagnostic steps and possible treatment options, dealing with the expectations of the patient and partner. The involvement of partners is highly desirable (ED inevitably affect the harmony of the couple). The correct information is an essential component in the treatment of ED.

### Specific tests

Currently, it is considered necessary, the execution of the following tests:

- testosterone, total and free;
- prolactin;
- glucose;
- triglycerides;
- cholesterol;
- PSA (for patients older than 50 years) <sup>6</sup>.

These tests are useful to detect any endocrine or metabolic abnormalities can cause ED <sup>3</sup>. The results of these investigations, together with the information obtained from a proper medical history and a thorough physical examination, in many cases allow the specialist to move towards a diagnosis of the utmost causes of ED, so that we can begin the treatment most appropriate.

### Further diagnostic

Among the specialized equipment needed to further test the diagnostic, we can distinguish at least three different levels.

At the first level, must be reported:

- the night penimetry computer (npnr-test), which consists in the recording of episodes of spontaneous erection that always occur during sleep in healthy subjects. This test is very useful for an initial discrimination between prevailing psychological causes of ED or organic base;
- the Eco-color Doppler dynamic of the penis, which is indicated for the evaluation of the integrity of the vascular penis. This is a dynamic study, namely functional, performed in basal conditions and after stimulation with vaso-active drugs injected inside the penis, with the aim of studying the inflow and the outflow of blood in the condition of erection induced pharmacologically <sup>5</sup>.

There are also instrumental examinations of a second level that are indicated in selected cases. Among these:

- the test response to the drug-stimulation intracavernous consists of the evaluation of the erectile response of the patient after intracavernous injection (ie in the penis) of a vaso-active drug in dosage standardized (prostaglandin E1 mcg or papaverine 20 mg);
- it is a rapid test and inexpensive because the quality of the response is evaluated by the specialist by observation and palpation. Currently, in highly specialized andrology centers, this test is performed in conjunction with computerized recording real-time (RigiScan FIC-test): this allows an objectivization of the result and a possible comparison with other surveys;
- the computerized recording of the erectile response to visual erotic stimulus adequate (RigiScanVSS) performed at baseline and after oral administration of pro-erectile drugs: the results will be compared with each other and with the examination Night (NPT test) and allow the specialist to draw important diagnostic deductions and at the same time evaluate the effectiveness of a possible oral therapy;
- the cavernosometry/graphy dynamics (LINK 15-16-17-18) that allows to study the integrity of the mechanisms of entrapment of the blood inside the penis, during erection and to identify the presence of any abnormal exhaust ports;
- the study neurological reflex bulbo-cavernous provides indirect information, but very useful when there is a suspicion of a neurological component to the base of ED;
- the test of ejaculatory latency with vibrostimulation that allows to check for sensory discomfort in the peripheral and to quantify the extent of a reported premature ejaculation.

If eventually the patient is a candidate for surgery, for example, a young subject who has suffered a trauma of the pelvis or in cases of acquired fibrosis of the penis, may be indicated special examinations third level:

- digital selective hypogastric-cavernous arteriography that, through the introduction of contrast medium in the arterial tree radiological allows to obtain very detailed images of small arterial branches that bringing blood to the penis allow the erection;
- angio-MRI with gadolinium: it is a very recent and elegant method that synthesizing the information offered by the two previous (arteriography cav-

ernosa of the penis and dynamic MRI) allows to obtain anatomical and functional frameworks that were unthinkable a few years ago;

- dynamic MRI of the penis which is the imaging modality is most appreciated by the surgeon and the patient to the clarity of the anatomical image that are of great help in pre-operative phase.
- It should be stressed that the diagnostic-therapeutic approach of patients with ED often require a multidisciplinary collaboration, which will see the specialist urologist use, where indicated, consulting psychologist, endocrinologist, cardiologist, neurologist, or any another specialist whose specific skills become necessary in the progress of the diagnostic.

## Therapy

The first and most important form of treatment for a patient suffering from erectile dysfunction is to identify and possibly modify or remove all hazardous conditions for sexual health, whether they are represented by bad habits (excessive sedentary lifestyle, chronic stress, cigarette smoke etc..) or overeating (obesity, alcohol abuse) or eventually recruitment of drugs and medicines involving depressing side effects erectile function.

The causes and modifiable risk factors are the following:

- lifestyle and psychosocial factors (smoking, alcoholism, substance abuse, relationship conflicts, lack of information, lack of experience, depression);
- sex education: awareness, changes in age, foreplay, lubrication of the partners;
- drugs (change class or dose): antihypertensives, antipsychotics, antiarrhythmics, anti-androgens, steroids, finasteride;
- hormone replacement therapy: hypogonadism, hyperprolactinemia.

It is clear that in cases where it can be detected underlying disease can cause the onset of ED (diabetes, hypertension, hypercholesterolemia, etc.), The correct therapeutic approach will be to correct or cure the disease to obtain a satisfactory compensation.

Unfortunately, in most cases, it is not possible to recognize a definite cause of ED, so the specialist is forced to propose a "symptomatic" therapy ie palliative a solution that corrects the "symptom" DE without being able to provide the patient with a future resumption of the natural erectile function.

As in the case of diagnostic tests, even for the dif-

ferent therapies of DE we can distinguish different levels, which are different for the progressive greater invasiveness.

## First-line treatments

### *Selective inhibitors of 5-phosphodiesterase*

During the 90s it was discovered a family of drugs which, administered by mouth, allow a truly effective treatment of almost all forms of ED: these are selective inhibitors of 5-phosphodiesterase (PDE5).

The action of all these drugs is carried out at the peripheral level (ie directly into the penis) and consists in improving and maintaining the flow of blood in the corpora cavernosa (erectile structures of the penis), and leading to a better quality of erection. The Phosphodiesterase (PDE) catalyze the hydrolysis of the second messengers cAMP and cGMP, which are responsible for the activation of a course of events that ultimately lead to the relaxation of smooth muscles. Both of these second messengers are involved in signal paths within the corpus cavernosum. The superfamily of proteins cyclic nucleotide PDE can be divided into at least 11 families of structurally and functionally related enzymes. Until now, different isoforms have been characterized, all different in their primary structure, specificity for cAMP and cGMP and mechanisms of regulation and tissue distribution. Molecular studies have demonstrated the presence of different isoforms but functional studies have revealed an active role only for PDE3 and PDE5. Three different isoforms of PDE5 were cloned into the tissue of the human penis. Two isoforms were identical to PDE5A1 and PDE5A2, by not penile tissue, while the third PDE5A3 was new. This isoform was present in tissues with a component of smooth muscle or cardiac muscle. Recently, the three-dimensional structure of the catalytic domain (residues 537-860) of human PDE5 complexed to the three molecules Sildenafil (Viagra), Tadalafil (Cialis) and Vardenafil (Levitra) was determined by offering the opportunity to design potent and selective inhibitors. Tadalafil is a potent inhibitor of PDE5, has a half-life of 17.5 h and a lasting effect up to 36 h after dosing. Tadalafil is effective and well tolerated. In a recent study, it was demonstrated that the Tadalafil 20 mg, administered on alternate days in patients with an increased cardiovascular risk, causes improvement in endothelial function regardless of the degree of ED. The study showed a significant effect of tadalafil compared to placebo on FMD (flow-mediated dilatation) of the brachial artery. However, this was a small study (32 patients), therefore, no definitive conclusion can be drawn. Through a study of healthy

volunteers, it was shown that therapeutic concentrations of tadalafil do not produce clinically significant changes in the clearance of drugs metabolized by CYP3A. In fact, in a recent clinical study, the pharmacokinetics of midazolam and lovastatin, 2 different CYP3A substrates, was substantially unchanged after taking Tadalafil co-administered. For Tadalafil, like Sildenafil and Vardenafil, we studied the possible interaction with alpha-blockers, important drugs in the treatment of benign prostatic hypertrophy. Tadalafil (20 mg), enhances the hypotensive effect of doxazosin, producing an average decrease in standing systolic blood pressure significantly greater than placebo. In contrast, in patients treated with tamsulosin, 10 and 20 mg Tadalafil produced a mean reduction in systolic blood pressure similar to placebo, suggesting that the drug should be used with caution when patients using doxazosin. Useful to consider that grapefruit juice causes the irreversible inactivation of cytochrome P450 3A4. This means that it can interact with sildenafil, tadalafil or vardenafil, resulting in severe systemic vasodilation, especially when combined with a nitrate therapy.[8] The therapeutic aspect of great interest that these molecules present, consists, as well as its efficacy, in the fact that they act only in the presence of an adequate stimulus sexual: this translates in an excellent acceptance by the patient and the partner. The best known and founder of such drugs is sildenafil (known to all as Viagra), to which are added two other molecules: tadalafil (brand name Cialis) and vardenafil (trade name Levitra or Vivanza). These pills should be taken "as needed" or about 40 minutes before attempting to have sex and their effect wears off in the next 4 hours. From this point of view, is characterized tadalafil (Cialis), the effectiveness of which lasts for more than 24 hours. The effectiveness of this class of drugs is very good: about 70% of all men with ED of all degrees, responds positively to selective inhibitors of PDE5<sup>9</sup>. Categories of patients who do not get the benefit of taking them are essentially those classified as "severe organic", in particular those with severe vascular disease or patients undergoing demolition surgery (usually necessary to remove a tumor) that resulted in the disruption of neural circuits necessary to trigger an erection (removal of the bladder or rectum, enlarged removal of prostate). These drugs are well tolerated, as side effects are usually mild and decreased over time<sup>10</sup>.

They consist of:

- headaches;
- redness of the face with hot flashes;

- muscle aches;
- gastrointestinal disorders;
- mild hypersensitivity sight.

#### *LUTS e ED*

Very recently observational and epidemiological studies indicate the existence of a possible link between LUTS and ED<sup>11</sup>, it is necessary to question whether LUTS to have an impact on sexual function or if both conditions are linked by a common underlying mechanism. In this regard, several pathogenetic hypotheses have been proposed to explain this Link: adrenergic hypertonia activation of Rho kinase, pelvic atherosclerosis<sup>12</sup>. On closer inspection the complexity of the pathophysiological mechanisms were involved in order to explain the link between LUTS / BPH appear to have different mechanisms in common and interconnected, so how these theories have several common points with the pathophysiological mechanisms proposed to explain medical conditions coma syndrome or the metabolic role of inflammation in prostate disease<sup>6</sup>. This broad connection between the different theories proposed seems to have a major impact in clinical practice for patients with LUTS and ED disorders<sup>5</sup>. On the one hand, certainly can complicate the diagnostic workup of patients with ED and LUTS on the other hand seems to open new scenarios therapeutic and broaden the range of treatment options available to us so that treatment options can overlap, allowing prevention or treatment of both conditions simultaneously. It has not yet certain about the data, you must change the clinical approach to the patient with concomitant LUTS and ED, not treating them more as two distinct conditions that are often approached by different specialists, but rather with a clinical approach integrated so each patient with LUTS should also evaluated from the point of view of sexual function, as well as each patient with ED should be evaluated from the point of view of the urinary function. An approach of this kind would certainly help the clinician in the choice of treatment appropriate for each patient in view of the fact that the current therapies for LUTS are burdened by side effects at different levels of sexual function (libido, erection, ejaculation) and above in the light of numerous scientific evidence for a role of PDE-5 in the treatment of LUTS, as revealed by a recent meta-analysis on this topic. On this basis, each patient with LUTS should be carefully informed of any possible adverse effects on sexual function related to drug therapy and surgical treatment of LUTS / BPH, as well as the clinical in follow-up treatment of patients with LUTS should carefully monitor the sexual function through validated questionnaires<sup>14</sup>.

## Hormonal therapy

Part of action of the first level is included hormone therapy that actually should be considered separately. The indication to the administration of testosterone (the male sex hormone) is in fact reserved for cases of proven deficiency of this hormone in the blood. However, it should be considered that there is an age-related physiological decline in testosterone, so that it is estimated that about a quarter of men over the age of 60 years present a hypogonadism mild or moderate. Thus, in recent years it has come spreading among specialists a particular interest in this category of persons of mature age (over 60 years) in which can recognize the presence of a combination of symptoms and physical signs and laboratory findings (ie what is known as a syndrome) defined LOH, or "androgen deficiency in later life". The main symptoms of this syndrome consist of a decrease in sexual desire, erection, mass and muscle strength in thinning of hair, in a certain mood instability with a tendency to irritability and depression and memory. When this corollary of signs and symptoms is associated with evidence of a deficiency of testosterone in laboratory tests, it is feasible to testosterone therapy, the administration of which is represented by the most current formulation in gel. In the cases mentioned, the daily application on the skin of the back or abdomen of testosterone gel (contained in special bags) quickly restores the normal level of this hormone in the blood, thus correcting most of the problems related disorders including sexual. The possible side effects associated with the administration of testosterone (urinary retention, swelling of the breasts) are generally absent or very well tolerated when used in compliance of the dosage schedule. In the past it was emphasized a particular aspect related to hormone therapy in the mature: the risk of unmask a possible prostate cancer <sup>15</sup>.

## Second-line treatments

Essentially include intracavernous injection of vaso-active substances. The corpora cavernosa are the functional erectile structures of the penis that are easily achieved by using short and thin needles (such as those for insulin) and injecting the lateral wall of the penis. The patient is instructed in the correct use of the drug by the specialist and, generally, three outpatient sessions are sufficient to identify the dose of medication suited to the specific case and make the patient alone to initiate therapy at home. With regard to the intracavernous injection therapy in the treatment of ED, patients are candidates did not respond or contraindicated to oral therapy and

physiotherapy rehabilitation after radical surgery pelvis. The introduction of oral drugs effective in treating ED has certainly reduced the indications for this type of treatment which, until recently, was widely used all over the world. Remains a very effective (complete response in more than 80% of patients) and is indicated in the percentage of patients suffering from ED who cannot benefit from oral therapy, or because they precluded (heart patients who take nitrates, recent myocardial infarction) or because results non-responder (approximately 30%). The vaso-active drugs injected directly into the penis, producing an erection regardless of sexual stimulation, which makes this type of treatment the first choice for those who have been damaged neural circuits that carry the impulse erection (for example patients who have undergone surgery with excision of the rectum or the bladder for tumors).

## Third line Treatments

### *Revascularization of the penis*

They are part of the therapeutic possibilities of choice for the treatment of ED, even revascularization surgery, ie the artery bypasses that restore blood flow to the penis. Candidates for this type of operation are only young patients (younger than 50 years), non-smoking or diabetes, who have suffered a trauma to the pelvis or perineum (the area between the testicles and the anus) that has lesioned one or both arteries that ensure the normal flow of blood to the penis.

### *Implants*

This intervention was proposed over 30 years ago and today in the world tens of thousands of men are carriers of this device. The prosthetic implant has always represented "the ultimate solution" for a patient suffering from erectile dysfunction, but at the same time is the only effective solution to 100% in any case of ED. The technological evolution has led to major advances in materials and the experience of thousands of procedures performed around the world mean that complications are currently very limited, and you have less than 10% of cases. The degree of satisfaction of patients who have undergone surgery is usually very high.

There are different types of penile prostheses, divided into two main categories:

- hydraulic;
- non-hydraulic.

The hydraulic prostheses are the most suitable for patients with a complete ED and wish to maintain a normal appearance of the penis at rest. The main limitation of these prostheses is represented by the

high cost and the need for a minimal manual dexterity required for activation and deactivation of the cylinders. The aesthetic and functional result, however, is guaranteed.

The not-hydraulic prosthesis will consist of a pair of cylinders of various material, which, depending on their size and different stiffness can be distinguished in:

- malleable;
- soft (Subrini-Austoni).

The hydraulic penile implants and soft, are the final solution to many problems of severe erectile dysfunction.

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