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**DIAGNOSIS AND  
MANAGEMENT OF  
IMPOTENCE**

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**ZORGNIOTTI  
LIZZA**

# Diagnosis and Management of Impotence

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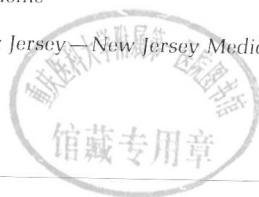
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The authors and publisher have made every effort to ensure that the patient care recommended herein, including choice of drugs and drug dosages, is in accord with the accepted standards and practice at the time of publication. However, since research and regulation constantly change clinical standards, the reader is urged to check the product information sheet included in the package of each drug, which includes recommended doses, warnings, and contraindications. This is particularly important with new or infrequently used drugs.

To my parents.

A.W.Z.

For Roberta, Carla, Gianna,  
Marcello, Concetta, and Enrico

E.F.L.

# PREFACE

During approximately the past 15 years, it has become amply apparent that impotence is primarily a vascular problem. Rapid advances in the field have provided new ways of treating the different facets of this major disease. Penile implant and psychotherapy are no longer the only methods of treatment for this vexing problem. By modifying blood flow to and from within the corpus cavernosum, many men are again able to have real erections and satisfying intercourse. The result is a brightening of outlook and self-esteem. This book addresses the practicalities of achieving this end. Managing a practice that is devoted to sexual dysfunction requires dedication and many skills. We have endeavored to make available our experience and *modus operandi*, garnered over the past 15 years, to the reader.

In 1978, the Department of Urology at New York University School of Medicine sponsored a Conference on Corpus Cavernosum Revascularization for Impotence. Word had been circulating that there existed a new operation that would restore lost potency by bypassing blood to the corpus cavernosum penis. Investigation uncovered the fact that Dr. Harry LeVeen, an innovative surgeon in Brooklyn, had done a few such procedures. One hundred fifty-eight interested physicians and scientists attended the conference. Several of the presentations proved to be eye openers, including one by the late Dr. Jean-François Ginestíé, who gave a magisterial talk on selective pudendal arteriography, and another by Dr. Vaclav Michal, who performed the first pudendal bypass in 1972. Dr. Michal has kindly provided a Foreword to this volume.

From this beginning has come the International Society for Impotence Research, whose main function is to provide a venue for scientific presentations. Its biennial congress has made it possible to document the ingenuity of the human mind in opening up new frontiers for the research and treatment of impotence.

I would like to thank my co-author, Eli F. Lizza, for his chapters on surgery for revascularization and venous insufficiency. Dr. Lizza is one of a few urologists currently performing microsurgery, a skill that is central to revascularization.



I am also grateful for the friendship of Dr. Giuseppe Rossi, a vascular surgeon at Cabrini Medical Center in New York City, and Dr. William W-L. Shaw, a plastic surgeon, until recently at New York University and Bellevue. Both of these men exhibited great surgical skill and patience while performing the initial procedures and innovations as they developed.

Thanks are also due to Dr. Irwin Goldstein and Dr. Tom F. Lue for allowing us to come into their operating rooms to observe the surgery they performed, especially that for venooclusive dysfunction. Their ideas and willingness to share them is a tribute to the collegial spirit shared by urologists.

The medical illustrations prepared for this book are by Patricia Kuharic and Susan Stoll. Special thanks are due to the Lenox Hill Hospital Medical Photography Unit, where most of the photographic work, including the extensive radiographic atlas, was done. We also wish to acknowledge Diane-Marie Gioco and Angela Cordaro for long hours dedicated to the production of the manuscript. Thanks also to the staff at B.C. Decker for their help in preparing this volume.

Adrian W. Zorngiotti, M.D.

# FOREWORD

Vascular surgery can affect the basic elements of male sexual function: erection and fertility. Erection problems include vasculogenic impotence, priapism, and erection disorders following lumbar sympathectomy. Fertility problems include disorders of spermiogenesis in patients with varicocele, and disorders of spermatozoal transportation after aortoiliac reconstruction or lumbar sympathectomy.

According to clinical symptomatology, the arterial supply of the corpus cavernosum (CC) can be subdivided into the proximal part, which is common with the arterial supply of the lower extremities (aortoiliac), and the peripheral part from the hypogastric artery to the helicine arteries, which terminate in the lacunae of the CC (hypogastricocavernous system—HCS).

Aortoiliac occlusive disease (AIOD) is associated with a high incidence of erection disorders (60 to 80 percent of those indicated for reconstruction). Analysis of aortographic findings and measurement of the blood pressure in the penile arteries has shown restriction of blood flow in the branching of the hypogastric arteries. These lesions participate in the restriction in about 60 percent of cases.

Aortoiliac reconstruction can cause either deterioration or improvement of erection and disappearance of ejaculation. To improve or maintain erection, aortoiliac surgery should maintain or restore the pathway to the hypogastric arteries and its branches. This requirement can sometimes be fulfilled by simple aortofemoral bypass, by additional branch to the hypogastric artery, by endarterectomy, or by a combination of endarterectomy and bypass. According to our experience, restoration of full flow into the hypogastric artery and its branches can improve or restore erection in about 70 percent of these men.

The pelvic steal syndrome involves claudication of the lower limb(s), often with gluteal claudication, and a special type of erection disorder: normal erection at rest that recedes at the start of coital movements. Hemodynamically, it is characterized by a change in the distribution of the restricted blood flow during loading of the gluteal and femoral muscles. The working muscles “steal” the blood delivered to the cavernous bodies below the threshold needed to maintain erection. Aortographic findings of the pelvic

steal phenomenon include severe stenosis or occlusion of one or more of the arteries that are common to the pelvic floor, gluteal, and/or femoral muscles, with reversal of blood flow in one or more arteries normally supplying the pelvic floor in a genitofugal direction. Aortography can differentiate an external iliac, femoral, and gluteal steal phenomenon. However, neither need be accompanied by a clear clinical syndrome. If the pressure in the penile arteries is below the threshold value at rest, the patient cannot achieve normal erection at all.

It is generally held that lumbar sympathectomy (LS) carries the risk of loss of erection and/or ejaculation, both owing to interruption of the sympathetic pathways innervating the genitalia. According to aortographic findings, 21 male LS candidates were subdivided into three groups: (1) seven men with aortoiliac stenoses and occlusions; (2) three men with lesions distal to the common femoral artery and bilateral isolated stenoses or occlusions of the hypogastric arteries; and (3) eleven men with lesions distal to the common femoral artery and an intact pelvic bed. All men but one in groups (1) and (2) suffered from erectile disorders, while all men in group (3) had normal erection. Penile brachial pressure index (PBPI) and mean pressure in the penile arteries were obtained before surgery at 6 days, and at 6 months following LSE, at which time erectile function was also assessed.

No significant changes in PBPI and erectility after LS were observed in groups (2) and (3). On post LS day 6 and at 6 months, all patients in group (1) showed a decrease in PBPI and mean pressure in the penile arteries averaging 54 and 56 percent of the preoperative values, respectively. Two patients died during the follow-up period; two who were impotent before LS remained so; two had decreased penile artery pressure with short-lasting and incomplete erections; and one man, with normal erection before LS, reported complete impotence.

This suggests that (1) LS carries the risk of worsening erectility in men with AIOD only, and not in those with peripheral lesions and an intact aortoiliac bed; (2) the complication is due to a decrease in penile artery pressure, not to sympathetic denervation; and (3) interruption of the sympathetic pathways is responsible for ejaculatory disorders.

In contrast to AIOD (with erectile disorder being only a part of a larger syndrome), impotence is the only symptom of lesions of the HCS. Some of these are not detected by a decrease in pressure in the penile arteries as these become hemodynamically significant only at the time of loading at the time of erection. More important, in this respect, is functional examination of the CC during artificial erection (dynamic cavernometry after administration of a vasoactive substance and measurement of systolic, diastolic, and mean pressure at the time of loading by erection). Monitoring and registration of volume changes, intracavernous pressure, infusion rate, and blood pressure in the cavernous arteries can differentiate normal hemodynamics, insufficient delivery of volume and pressure to the CC, high leakage into the venous return, mixed vasculogenic impotence, and ineffective contractions of the pelvic floor muscles.



From the technical point of view, the indication for reconstruction of the HCS is determined by the type and location of the lesions and by the accessibility of the different arterial segments as seen on phalloarteriography.

Short, isolated stenoses of the internal pudendal artery have been reached by a gluteal approach, and an iliaco- or gluteo-pudendal bypass can be constructed. The distal portion of the pudendal artery is approachable by perineal incision, and femoropudendal autovenous bypass was the first procedure we used for reconstruction on the pudendal artery in 1972.

The proximal HCS can be bypassed by epigastricopenile anastomosis, which we started to use in 1977. This procedure is indicated in those lesions in which the bifurcation on the penile artery into the dorsal and cavernous arteries remains patent, therefore allowing the CC to be supplied by back flow.

According to our experience, the best results (70 to 80 percent) are achieved by reconstruction of the hypogastric arteries. Similar results are obtained with percutaneous transluminal angioplasty, but this procedure is often associated with restenosis and reappearance of the disorder within 1 year. Lower success rates in microsurgical procedures can be attributed to a lower patency rate and incorrect indications. Circulatory factors play an important and often decisive role in many sexual disorders. Vascular surgery and invasive radiology can save or restore sexual function in at least some of these patients.

MUDr. Vaclav Michal, Dr. Sc.  
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# 1

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## OVERVIEW

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The ancient Greeks thought that air (*pneuma*) flowed in the arteries and also into the penis to produce erection. This was based on two observations. The penis, like the arteries in the cadaver, was invariably found to be devoid of blood when dissected. Because air is less dense than blood, the rapidity with which erection could come about made air a logical choice.<sup>1</sup> During the Renaissance it was thought that erection was caused by the perineal musculature, which was dissected by many anatomists. This conclusion, based on structural observation, prevailed until the seventeenth century when Regnier de Graaf, whose name is more closely identified with the female reproductive tract, found that he could produce erection in the cadaver by injecting water into the hypogastric artery with a syringe of his invention.<sup>2</sup> This demonstration, which took place shortly after Harvey's discovery of the circulation of the blood, makes de Graaf just as important a figure in male reproductive function.

During the nineteenth century and up until after World War I, impotence came under the purview of a forerunner of the urologist—the venereologist—because it was generally thought to be a sequela of gonorrheal infection, posterior urethritis, or excessive masturbation or coitus earlier in life.<sup>3</sup>

In the 1940s, Leriche observed a relation between obstruction of the aortic bifurcation and impotence.<sup>4</sup> When vascular surgeons began reconstruction of the aorto-iliac bifurcation, patients would sometimes report restoration of potency. This observation was among the earliest to associate diminished blood flow with impotence.

A major change came about after 1910, when an explanation for impotence based on the Freudian theory of Oedipal conflict became firmly

embedded in the minds of physicians and the public so that impotence came to be attributed to psychogenic causes.<sup>5</sup> A frequently quoted figure had it that impotence is 94 percent psychogenic in origin, leaving room for obvious organic entities such as absence of the penis, hypoplasia of the penis, Peyronie's disease, the postpriapism state, paraplegia, and so forth. For more than a half century, the treatment of impotence was the province of the psychiatrist and related professionals. Stable older men, who had always functioned well until the onset of their impotence, did time "on the couch" for this complaint.

The 94 percent figure for the prevalence of psychogenic impotence made a surprising about-face when it became apparent that impotence is mainly due to pathologic disturbance of blood flow, usually within the penis—a change in viewpoint that is now shared by psychiatrists. In the mid-1970s, Jean François Ginestie, a French radiologist, and Vaclav Michal, a Czechoslovak vascular surgeon, independently performed selective pudendal arteriography demonstrating obstructive arterial disease in impotent patients.<sup>6,7</sup> This new information led to a further step when Michal performed the first inferior epigastric artery to corpus cavernosum microsurgical bypass.<sup>8</sup>

Erection requires rapid and large inflow of arterial blood and concomitant restriction of the venous outflow by the erectile body. Both phenomena depend on smooth muscle relaxation. When there is erectile failure, abnormal blood flow is involved, regardless of what cause of impotence has been assigned by the clinician (Fig. 1-1). In other words, even if impotence is psychogenic or neurogenic, the net effect is that blood

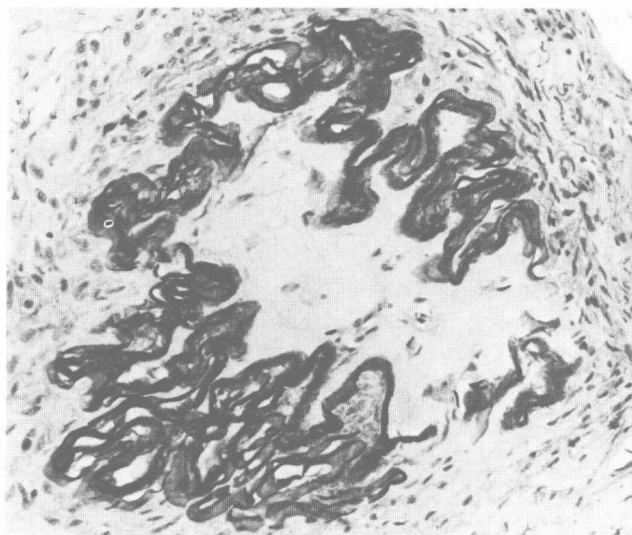


FIGURE 1-1 Cross-section of dorsal penile artery showing complete occlusion in an impotent patient.

flow within the penis is altered. Understanding this has given rise to new research into the physiology of erection and new ways to treat impotence by increasing blood flow to the erectile bodies. This in turn has given rise to a subspecialty in sexual dysfunction.

Another area of study, which has been rapidly exploited, is the use of pharmacologic agents injected directly into the erectile body to produce erection but also to study the erectile process. One of the principal agents is the smooth muscle relaxant, papaverine hydrochloride. This agent has already been used extensively to produce erection for intercourse, has made pudendal arteriography easier, and has helped clarify the mechanism of outflow restriction in the erectile process by mimicking the effect of neurotransmitters by producing relaxation of the cavernous spaces and compression of the outflow veins. Papaverine has also been useful for *in-vitro* studies of cavernous tissues.

The use of papaverine has been attributed to Michal, who was said to have accidentally injected the substance at operation, producing an erection.<sup>9</sup> Michal has denied this, although a graduate student working for him at the time experimented with intracorporal papaverine.<sup>10</sup> Virag used intracavernous papaverine in conjunction with pumping heparinized saline into the corpora to produce an artificial erection. His impotent patients found that they could have spontaneous erection for several months thereafter.<sup>9</sup> Following this, Zorngiotti began to study autoinjection of papaverine by diabetic patients.<sup>11</sup> He later published his findings on self-injection of papaverine with phentolamine to produce erection when desired in men with impotence of various causes. This drug combination produces excellent erection in most.<sup>12</sup> Ishii expanded the list of available agents by introducing prostaglandin E<sub>1</sub> (alprostadil) for the same purpose.<sup>13</sup> Prostaglandin E<sub>1</sub> and papaverine hydrochloride are smooth muscle relaxants, whereas phentolamine mesylate is an alpha-adrenergic blocking agent. In general, these agents safely produce excellent erection with few complications. The only inconvenience is the necessity of self-injecting the penis each time intercourse is desired, but this does not deter a motivated patient.

A curious footnote is the issuance of a U.S. Patent, in 1978, to Latorre for a double-barreled syringe that injects vasoactive substances into both corpora simultaneously (Fig. 1-2).<sup>14</sup> Latorre never published clinical results with the syringe, however, nor did he take into account the open connection between the two corpora.

## THE PATIENT

Patients who, a decade ago, were reluctant to ask for help are now telling their doctors about their inability to have an adequate erection. Often, the response is to shrug off the matter with an allusion to the inexorable

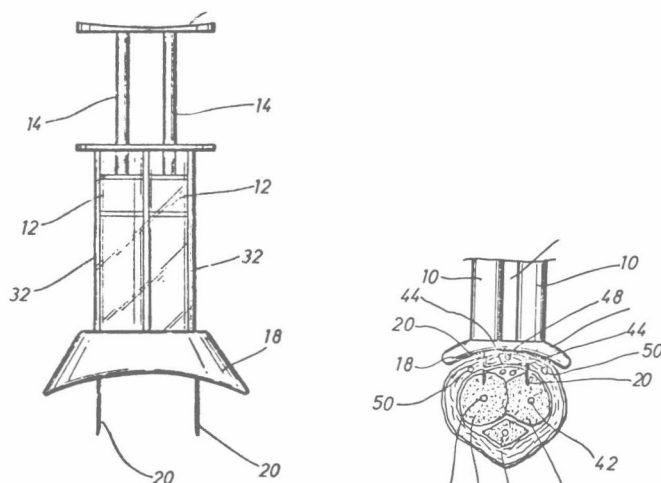


FIGURE 1-2 Double-barreled syringe (left) patented in 1978 by Alvaro Latorre, a family practitioner in El Paso, Texas. Although Latorre did not consider the permeability of the septum dividing the two corpora, making a double syringe unnecessary (right), he did intend that vasoactive drugs be used to produce erection before Virag's original suggestion. Unfortunately, Latorre did not publish his clinical experience. The effects of vasoactive substances, especially phentolamine, on erection were understood even prior to this.

aging process. This reaction is puzzling and bewildering to the patient who probably had steeled himself to speak out when he did. Perhaps the practitioner, not unlike health insurance companies, perceives impotence to be a quality-of-life rather than a medical issue. In a move that is not based on any strong supporting data, the practitioner will often give the patient an androgen in the well-intentioned but mistaken belief that this restores erection. Androgen administration can produce an improved sense of well being and increased libido but only rarely produces any change in the ability to penetrate a partner, unless there is severe hypogonadism and the patient is relatively young.

It is not uncommon for impotent older men to have serum testosterone levels at or just below the laboratory limits of normal. This low reading is compounded by taking the blood sample at times other than 8:00 AM, when values are at their highest. The patient is told that he has "low testosterone," establishing a negative mind-set that then becomes difficult to alter. Yet, low testosterone may play a role in impotence even though the results of androgen administration are disappointing. Hypogonadism is thought to be a factor in ischemic heart disease in both sexes.<sup>15</sup> Anatomically, the cavernous arteries resemble the coronary arteries in that these are end arteries without collateral circulation. Whether or not these data on ischemic heart disease are relevant for impotence will require investigation. Studies have identified the same risk factors for impotence as for ischemic heart disease, namely aging, hypertension, diabetes, smoking,



and hyperlipidemia.<sup>16</sup> Efforts at preventing ischemic heart disease in the general population could produce a parallel decrease in impotence.

## Smoking, Ischemic Heart Disease, and Impotence

Patients with impotence are often heavy smokers or former heavy smokers. In my practice, more than 60 percent of patients are or have been heavy smokers—20 to 60 cigarettes a day for decades. It is not uncommon for the patient to say that he has given up smoking, implying that this is no longer relevant, but the truth is that penile artery damage has already taken place and is irreversible or will take considerable time to heal: In the case of ischemic heart disease, 15 or more smoke-free years have to pass before the risk of myocardial infarction wanes.<sup>17</sup>

## WHAT CONSTITUTES IMPOTENCE?

Impotence is the inability to perform or complete the sex act because of failure to achieve or maintain erection. Men who experience occasional performance difficulties or who can have coitus with one partner and not another do not have organic impotence and should be investigated, concurrently, for psychogenic factors. The practitioner should consider that organic and psychogenic factors can and do coexist. An occasional patient will say he is impotent, but on deeper questioning it becomes clear that he really is saying that he cannot perform as frequently or vigorously as he did before.

The list of diseases and medications implicated in impotence is long, so that evaluation to pinpoint a cause is important. Elimination of a disease or discontinuance of an implicated drug rarely results in restoration of potency, e.g., when diabetes is brought under control, smoking is stopped, or an antihypertensive drug is either discontinued or substituted. Although the underlying disease may not be eliminated, patients can reach a point where, on demand, vaginal penetration becomes possible using techniques that alter existing penile hemodynamics. In general, oral medications, hormones, diets, acupuncture, and psychotherapy give disappointing results.

Impotence can result from trauma, not uncommonly in younger men who are at greater risk, when injuries are to the pelvis and sometimes to the perineum. Younger men who might never have had an erection (primary impotence) are often labeled psychogenically impotent when in reality they have corporal veno-occlusive dysfunction or congenital arteriovenous malformation, which can be identified radiographically. Men falling into these categories make excellent candidates for evaluation and vascular reconstruction, with pharmacologic erection or implant the fall-back treatment should this fail.

## PENILE IMPLANTS

Implants need to be dealt with briefly, although they are outside the scope of this book. For many years an implant was the only method of assuring reliable sexual penetration. Prostheses do not produce erection, nor do they address the cause of impotence, but rather stiffen the penis for coitus. The advantage is a high degree of functional success—95 percent or better. This is a permanent, in-hospital, surgical implant that is not externally visible, although its presence may be detected by touch. Implants can be called upon anytime and as often as the patient desires. There are two types: semirigid or malleable rods implanted within the corpora cavernosa, the presence of which can be concealed by clothing, and mechanical prostheses that simulate erection but also give the penis a normally flaccid appearance when not in use. Being mechanical, this second type can be subject to device failure, which requires replacement surgery. The malleable prosthesis is less troublesome than the mechanical type, although improved technologies have decreased failures of mechanical prostheses considerably. Guided by the implant surgeon, the patient participates in the selection of his prosthesis.

Implants have gained wide urologist and public acceptance. There can be problems, which occur infrequently: Infection, despite intensive perioperative antibiotics, can necessitate implant removal; patients allergic to antibiotics are subject to additional risk. Unpredictable penile aching pain may result in a demand for removal. Erosion of the device, often through the distal urethra, necessitates removal. Preparation of the corpus cavernosum to receive the implant is thought to destroy the erectile tissue in the corpus cavernosum, so that other forms of treatment are no longer possible. Yet, some patients with an implant will report erection during coitus.

Implanted penis circumference and length can fall short of expectation, because the implanted penis will not reach the dimensions of the erected penis prior to the onset of impotence. Those whose nonerect penis is small should be made aware of this potential for disappointment beforehand. The patient with a long nonerect penis can hope for a more satisfactory result. Another unpredictable factor is that the glans is sometimes not supported by the implanted penis and can be annoyingly “floppy,” thus interfering with penetration and giving rise to what has come to be referred to as the “SST syndrome” in which the glans droops and resembles a supersonic aircraft during takeoff. This can often be corrected by reimplantation with a longer prosthesis if inadequate prosthesis length is seen to be the cause.

Despite potential but infrequent problems, implants deserve serious consideration when one is making a treatment decision. Men who are unable to stop smoking should consider implant over bypass microsurgery and pharmacologic erection, because these techniques depend on optimum blood supply, and continued smoking can only cause further deterioration. Implants

are a backup if the alternatives prove unsuccessful or unacceptable to the patient. There are regional differences in implantation acceptance: Per capita sales are seen to increase as one moves from the East to the West Coast, with the largest sales in Texas and California.

## BYPASS MICROSURGERY

In carefully selected patients, revascularization can yield excellent spontaneous erectile function. Michal's original procedure was to harvest the inferior epigastric artery with anastomosis, via an inguinal tunnel, directly to the corpus cavernosum at the base of the penis (the Michal I procedure). This resulted in restoration of erection, but these bypasses soon became occluded and erection ceased. Another problem was the occurrence of priapism in the postoperative period, requiring either ligation or banding of the bypassing artery. As a result, operations of this type got "bad press," a problem that persists even today. This led to modification with arterial (or arterial to venous graft interposition) microsurgical anastomoses to the dorsal (Michal II) and central (Crespo) penile arteries. Another approach has been to arterialize the deep dorsal vein, producing retrograde flow into the corpora, via a window in one corpus (Virag) or via the corporal emissary veins (Furlow).

Prior to bypass surgery, invasive diagnostic procedures are necessary to document the site of arterial obstruction and to plan the bypass. This consists of dynamic (i.e., with intracavernous papaverine injection) selective bilateral pudendal arteriography. Patients who develop a full erection with papaverine either alone or during intercourse can be deemed to have normal penile outflow restriction. With patients who do not obtain a full rigid erection, it is important to differentiate between inflow restriction and abnormal venous outflow by dynamic cavernosometry. Such diagnostic procedures should be restricted to patients who can reasonably be expected to undergo the operation and who have agreed to stop smoking. Otherwise invasive diagnostic procedures carry an unnecessary risk.

Bypass microsurgery is a procedure that usually requires about 10 hours to complete, but this can easily be cut to about 6 hours by employing two surgical teams. Because of prolonged anesthesia and the possibility of poor outcome in terms of erections, bypass is not advised (but not absolutely contraindicated) in men much over the age of 50 years, who are poor risks for anesthesia, or who have heart disease, diabetes, hypertension, prior extensive abdominal surgery, severe antibiotic allergy, or the inability to stop smoking.

Successful bypass leads to a return of spontaneous function. Doubts have been expressed about the efficacy of bypass microsurgery by Sharlip, who reported a personal series of 27 cases with five long-term successes