

# **PENILE PROSTHESIS IMPLANTATION IN THE MANAGEMENT OF ERECTILE DYSFUNCTION**

Essay

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## List of Abbreviations

<b>ACTH</b> .....	Adrenocorticotrophic hormone
<b>AMS</b> .....	American medical systems
<b>ART</b> .....	Androgen Replacement Therapy
<b>ASC</b> .....	adult stem cells
<b>BMSC</b> .....	Bone marrow stem cells
<b>cAMP</b> .....	Cyclic adenosine monophosphate
<b>CC-EMG</b> .....	Corpus cavernosum electromyography
<b>CDDs</b> .....	Color duplex Doppler Ultrasonography
<b>cGMP</b> .....	Cyclic guanosine monophosphate
<b>cNOS</b> .....	Constitutive NOS
<b>CNS</b> .....	Central nervous system
<b>CVOD</b> .....	Corporal veno-occlusive dysfunction
<b>DHT</b> .....	dihydrotestosterone
<b>DICC</b> .....	Dynamic infusion cavernosometry and cavernosography
<b>DRE</b> .....	Digital rectal examination
<b>ED</b> .....	Erectile dysfunction
<b>EDITS</b>	Erectile dysfunction inventory of treatment satisfaction
<b>ETs</b> .....	Endothelins
<b>FDA</b> .....	Food and Drug Administration
<b>FSH</b> .....	Follicle-stimulating hormone
<b>GABA</b> .....	Gamma -Amino Butyric Acid
<b>GTP</b> .....	Guanosine triphosphate
<b>HDL</b> .....	High-density lipoprotein
<b>HIV</b> .....	Human immunodeficiency virus
<b>ICI</b> .....	Intracavernosal injection
<b>ICP</b> .....	Intracavernosal pressure
<b>IIEF</b> .....	International Index of Erectile Function
<b>IPP</b> .....	Inflatable penile prosthesis
<b>ISSAM</b> .....	International Society for the Study of the Aging Male
<b>LDL</b> .....	Low-density lipoprotein

**List of Abbreviations** (Cont...)

<b>LH</b> .....	Luteinizing hormone
<b>LMN</b> .....	Lower motor neuron
<b>MMAS</b> .....	Massachusetts Male Aging Study
<b>MPOA</b> .....	Medial preoptic area
<b>MPP</b> .....	Malleable penile prosthesis
<b>MS</b> .....	Momentary squeeze
<b>MUSE</b> .....	Medical urethral system of erection
<b>NA</b> .....	Noradrenaline
<b>NAION</b> .....	Nonarteritic anterior ischemic optic neuropathy
<b>NANC</b> .....	Non adrenergic non cholinergic
<b>NIH</b> .....	National Institutes of Health
<b>NO</b> .....	Nitric oxide
<b>NOS</b> .....	Nitric oxide synthase
<b>NPT</b> .....	Nocturnal penile tumescence
<b>ORT</b> .....	One-touch release
<b>PDE</b> .....	Phosphodiesterase
<b>PDE<sup>o</sup></b> .....	Phosphodiesterase type <sup>o</sup>
<b>PEP</b> .....	Pharmacological erection program
<b>PGE</b> .....	Prostaglandin E
<b>PSA</b> .....	Prostate specific antigen
<b>PVN</b> .....	Paraventricular nucleus
<b>REM</b> .....	Rapid eye movement
<b>SMCs</b> .....	Smooth muscle cells
<b>SST</b> .....	Supersonic transport
<b>TU</b> .....	Transurethral
<b>TXA<sup>∇</sup></b> .....	Tromboxane A <sup>∇</sup>
<b>UMN</b> .....	Upper motor neuron
<b>VCDs</b> .....	Vacuum Constriction Devices
<b>VEGF</b> .....	Vascular endothelial derived growth factor
<b>VIP</b> .....	Vasoactive intestinal polypeptide



## INTRODUCTION

**E**rectile dysfunction (ED) is defined as the persistent inability to achieve and maintain an erection of sufficient quality to permit satisfactory sexual intercourse (*Andersson et al.*, 2003).

**ED** can have a significant impact on the physical and psychosocial health aspects of men and their partners, as evidenced by the large volume of publications on male sexual dysfunction. The development of ED is frequently attributable to both psychogenic factors as well as physiological alterations of neural, vascular, hormonal, and endothelial function (*Lewis*, 2001).

A recent international consultation collaborative study reported that the prevalence of erectile dysfunction (ED) increases as men age increase, and an estimated 20–30% of adult men between 40 and 70 years of age suffered from at least one episode of sexual dysfunction (*Hussein and Porst*, 2006).

Pharmacological therapy for ED has improved dramatically in the last 10 years and today the oral phosphodiesterase type-5 inhibitors are the most commonly used and successful treatments in first-line therapy. Intracavernous vasodilator injection therapy is a second-line treatment used to treat those cases where a mild-to-severe arteriogenic or veno-occlusive dysfunction is present with a consequent ineffectiveness of oral drugs. In patients where pharmacological therapy is unhelpful or contraindicated, another option is the surgical approach. Penile vascular surgery is suitable

for healthy men with acquired ED due to isolated stenosis of extra penile arteries without any kind of generalized vascular disease (*Montague et al., ۲۰۰۵*).

Penile prosthesis surgery represents the ‘gold standard’ in those patients in which ED has reached an end-stage and oral and Intracavernous pharmacological therapies are ineffective, contraindicated or cannot be tolerated. For example, in severe arteriogenic and venoocclusive dysfunction caused by severe systemic disease such as diabetes, hypertensive arterial syndrome, neurological disorders and related treatment (*Hatzimouratidis and Hatzichristou, ۲۰۰۴*).

Also used in treatment of ED caused by Non nerve-sparing pelvic surgeries performed on the bladder, prostate and rectum because of the interruption of the neurovascular bundles involved in erectile mechanisms (*Meuleman and Mulders, ۲۰۰۴*).

Penile prosthesis implants may also be used after radical surgery for penile cancer and for treatment of congenital or acquired missing penis (*Hoebeker et al., ۲۰۰۴; Jordan et al., ۱۹۹۴*).

Penile prosthesis implants may also be used to obtain rigidity in cases of phalloplasty (*Bettocchi et al., ۲۰۰۴*).

Penile prosthesis implant is recognized, at present, as the most effective option to obtain an artificial erection satisfactory for a sexual intercourse, These devices are subject to continuous development and they are achieving even better mechanical

reliability and safety, Patient satisfaction with the cosmetic appearance and the widespread use of prostheses reflect their quality and the experience gained by surgeons in device implantation (*Bettocchi et al.*, ۲۰۱۰).

Penile prosthetic implants remain a useful salvage approach to offer men with refractory ED and remain the most effective treatment to date (*Andersson*, ۲۰۰۸).

## **AIM OF THE WORK**

**T**his essay will focus on the role of penile prosthesis implantation, its indications and techniques in the management of erectile dysfunction.

## ANATOMY OF THE PENIS

### Structure:

The human penis is a unique structure composed of multiple fascial layers which surround the three cylinders of erectile sinusoid (*Hsu, 2007*).

The penis can be divided into three parts: **the root, the body, and the glans:**

**The glans** is the distal end of the corpus spongiosum, the edge of the glans overhangs the shaft of the penis, forming a rim called the corona (**Fig. 1**) (*Skandalakis et al., 2004*).

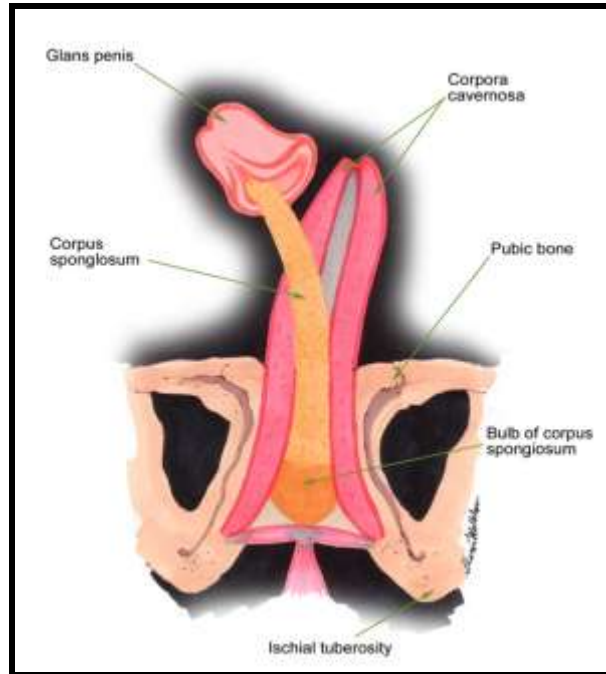
**The root** of the penis is located in the superficial perineal pouch, and consists of the crura, bulb, ischiocavernosus and bulbospongiosus muscles. The crura and bulb of the penis contain masses of erectile tissue. Each crus is attached to the inferior part of the internal surface of the corresponding ischial ramus, anterior to the ischial tuberosity (*Moore et al., 2006*).

**The penile shaft (body)** is composed of 3 erectile columns, the 3 corpora cavernosa and the corpus spongiosum, as well as the columns' enveloping fascial layers, nerves, lymphatics, and blood vessels, all covered by skin, The 3 suspensory ligaments, composed of primarily elastic fibers, support the penis at its base (*Jordan et al., 2007*).

The key structures mediating penile erection are the paired corpora cavernosa or 'erectile bodies', these cylindrical structures

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form the bulk of the penis and fill with arterial blood under pressure at the time of erection (*Kirby et al., ٢٠٠٤*).



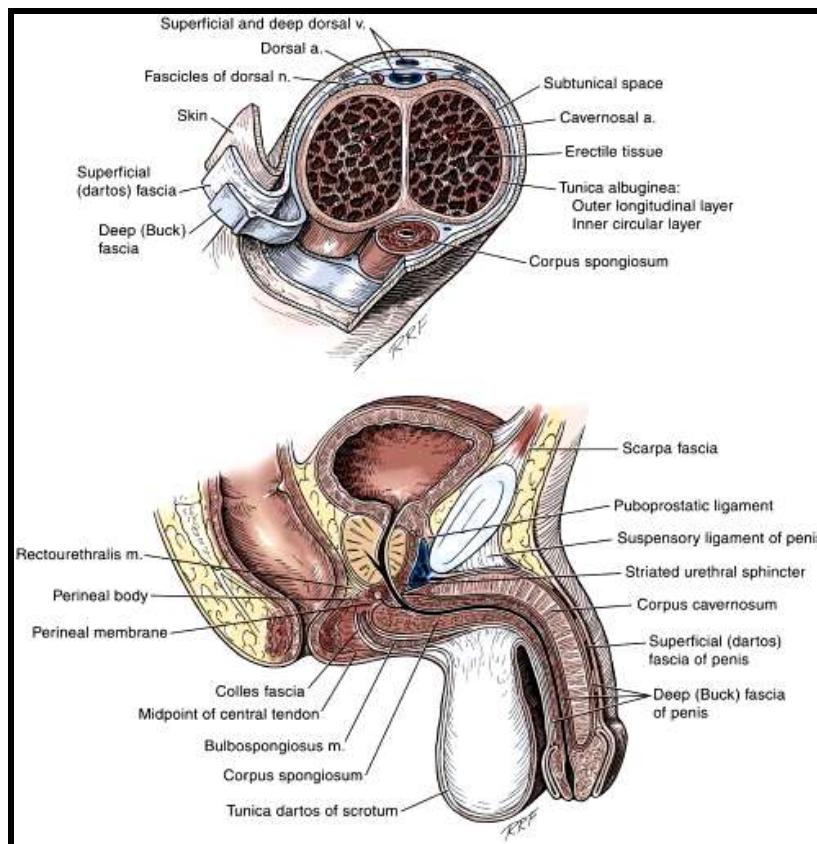
**Fig. (١):** Corporal bodies of the penis (*Skandalakis et al., ٢٠٠٤*)

The paired corpora cavernosa contain erectile tissue and are each surrounded by the tunica albuginea, a dense fibrous sheath of connective tissue with relatively few elastic fibers (**Fig. ٢**) (*Brooks, ٢٠٠٧*).

The erectile tissue within the corpora contains arteries, nerves, muscle fibers, and venous sinuses lined with flat endothelial cells, and it fills the space of the corpora cavernosa. The cut surface of the corpora cavernosa looks like a sponge. There is a thin layer of areolar tissue that separates this tissue from the tunica albuginea (*Moore et al., ٢٠٠٧*).

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The **tunica albuginea** consists of 2 layers, the outer longitudinal and the inner circular. The tunica albuginea becomes thicker ventrally where it forms a groove to accommodate the corpus spongiosum. The tunica albuginea of the corpus spongiosum is considerably thinner (< 1 mm) than that of the corpora cavernosa (approximately 2 mm). The thinner tunica albuginea of the corpus spongiosum also allows the corpus to become less rigid during erection. (*De Groat et al., 1988*).



**Fig. (1):** **Top,** Cross section of the penis at the junction of its middle and distal thirds. The septum is correctly illustrated as strands that interweave with the tunica albuginea both ventrally and dorsally. **Bottom,** Diagram of a sagittal section of the penis and perineum illustrating the fascial layers (*Devine et al., 1994*).