PENILE PROSTHESIS IMPLANTATION IN THE MANAGEMENT OF ERECTILE DYSFUNCTION

Essay

Submitted for Partial Fulfillment of Master Degree in Urology

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List of Abbreviations

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

List of Abbreviations (Cont…)

LH..... Luteinizing hormone
LMN..... Lower motor neuron
MMAS..... Massachusetts Male Aging Study
MPOA..... Medial preoptic area
MPP..... Malleable penile prosthesis
MS..... Momentary squeeze
MUSE..... Medical urethral system of erection
NA..... Noradrenaline
NAION..... Nonarteritic anterior ischemic optic neuropathy
NANC..... Non adrenergic non cholinergic
NIH..... National Institutes of Health
NO..... Nitric oxide
NOS..... Nitric oxide synthase
NPT..... Nocturnal penile tumescence
ORT..... One-touch release
PDE..... Phosphodiesterase
PDE٥..... Phosphodiesterase type ٥
PEP..... Pharmacological erection program
PGE..... Prostaglandin E
PSA..... Prostate specific antigen
PVN..... Paraventricular nucleus
REM..... Rapid eye movement
SMCs..... Smooth muscle cells
SST..... Supersonic transport
TU..... Transurethral
TXA٢..... Tromboxane A٢
UMN..... Upper motor neuron
VCDs..... Vacuum Constriction Devices
VEGF..... Vascular endothelial derived growth factor
VIP..... Vasoactive intestinal polypeptide

INTRODUCTION

Erectile 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., ٢٠٠٣).***

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, ٢٠٠١).***

A recent international consultation collaborative study reported that the prevalence of erectile dysfunction (ED) increases as men age increase, and an estimated ٢٠–٣٠٪ of adult men between ٤٠ and ٧٠ years of age suffered from at least one episode of sexual dysfunction ***(Hussein and Porst, ٢٠٠٦).***

Pharmacological therapy for ED has improved dramatically in the last ١٠ years and today the oral phosphodiesterase type-٥ 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., ٢٠٠٥).***

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, ٢٠٠٤).***

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, ٢٠٠٣).***

Penile prosthesis implants may also be used after radical surgery for penile cancer and for treatment of congenital or acquired missing penis ***(Hoebeke et al., ٢٠٠٣; Jordan et al., ١٩٩٤).***

Penile prosthesis implants may also be used to obtain rigidity in cases of phalloplasty ***(Bettocchi et al., ٢٠٠٤).***

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., ٢٠١٠)***.

Penile prosthetic implants remain a useful salvage approach to offer men with refractory ED and remain the most effective treatment to date ***(Andersson, ٢٠٠٣).***

AIM OF THE WORK

This 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, ٢٠٠٦).***

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. ١)** ***(Skandalakis et al., ٢٠٠٤).***

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., ٢٠٠٧).***

The penile shaft (body) is composed of ٣ erectile columns, the ٢ corpora cavernosa and the corpus spongiosum, as well as the columns' enveloping fascial layers, nerves, lymphatics, and blood vessels, all covered by skin, The ٢ suspensory ligaments, composed of primarily elastic fibers, support the penis at its base ***(Jordan et al., ٢٠٠٢).***

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

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

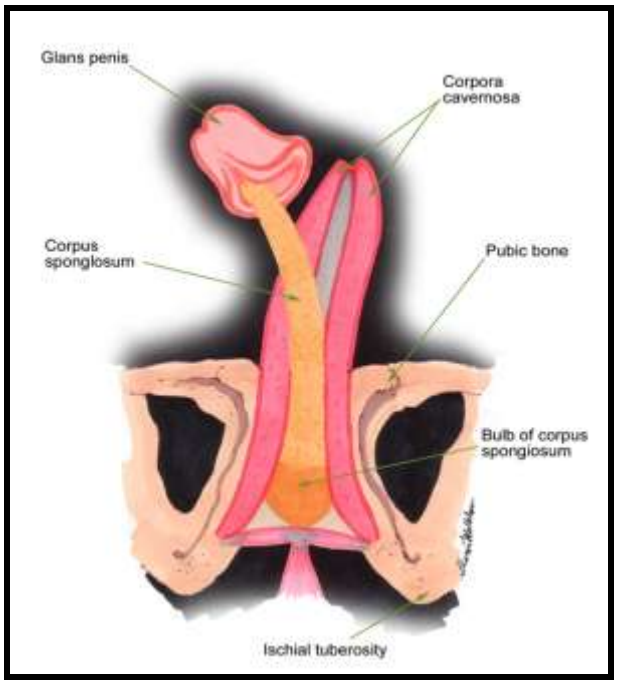

Fig. (١): Corporal bodies of the penis ***(Skandalakis et al., ٢٠٠٤)***

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, ٢٠٠٦).***

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., ٢٠٠٦).***

The tunica albuginea consists of ٢ 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 (< ٠,٥ mm) than that of the corpora cavernosa (approximately ٢ mm). The thinner tunica albuginea of the corpus spongiosum also allows the corpus to become less rigid during erection. ***(De Groat et al., ١٩٨٨).***

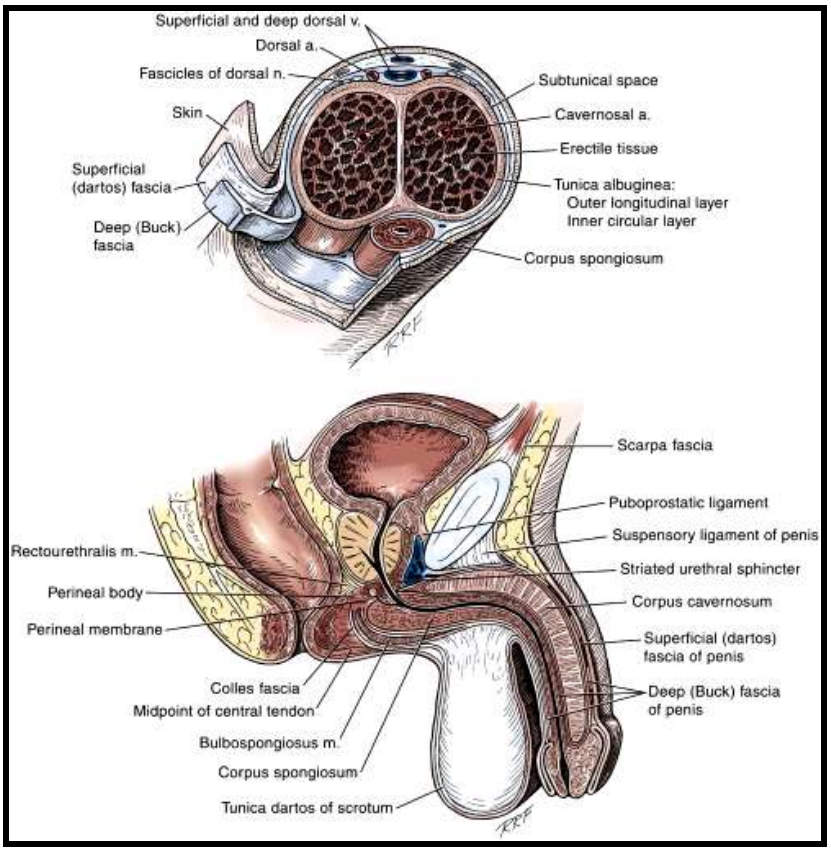

Fig. (٢): Top, Cross section of the penis at the junction of its middle and distal thirds. The septum is correctly illustrated as strands that interweave with the tunica albuginea both ventrally and dorsally. **Bottom**, Diagram of a sagittal section of the penis and perineum illustrating the fascial layers ***(Devine et al., ١٩٩٤).***