Association between Angiographic Pudendal Artery Disease and Angiographically Documented Coronary Artery Disease in Diabetic Patients with History of Erectile Dysfunction

Thesis for partial fulfillment of Master degree of Cardiology

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2009-2010

Acknowledgment

First and foremost, I thank Allah for helping and guiding me in accomplishing this work.

I would like to express my sincere gratitude to ***Dr. Tarek Zaki***, professor of cardiology, Ain Shams University, for his great support.

I must extend my warmest gratitude to ***Dr. Ahmed Shawky***, lecturer of cardiology, Ain Shams University, for his great help and faithful advice.

I can never forget to thank ***Dr. Ayman Mortada,*** lecturer of cardiology, Ain Shams University who helped and guided my steps one by one.

I must deeply thank ***Dr. Mohammad Abd Alzaher***, lecturer of cardiology, Ain Shams University, for spending alot of time instructing and encouraging me.

Last, I would like to thank all my colleagues for their co-operation and support as well as all the patients who had participated in this study.

Dedication

To the soul of my parents,

I dedicate this work

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List of Abbreviations

AUA	American Urological Association
BMI	Body Mass Index
CACS	Coronary Artery Calcification Score
CAD	Coronary Artery Disease
cGMP	Cyclic Guanosine Monophosphate
CHF	Congestive Heart Failure
CIA	Common Iliac Artery
CIN	Contrast Induced Nephropathy
Cm	Centimeter
CT	Computed Tomography
CTA	CT Angiography
CV	Cardiovascular
CVA	Cerebral Vascular Accident
DICC	Dynamic Infusion Cavernosometry or Cavernosography
DM	Diabetes Mellitus
DSA	Digital Subtraction Angiography
ED	Erectile Dysfunction
EIA	External Iliac Artery
EMEA	European Medicines Agency
eNOS	Endothelial Nitric Oxide Synthase
F	French
FDA	Food and Drug Administration
FSH	Follicle Stimulating Hormone
GTP	Guanosine triphosphate
HDL	High Density Lipoprotein
IIA	Internal Iliac Artery
IIEF	International Index of Erectile Function
INR	International Normalized Ratio
IPA	Internal Pudendal Artery

Kg	Kilogram
LAD	Left Anterior Descending
LDL	Low Density Lipoproteins
LH	Leutinizing Hormone
LM	Left Main
LVD	Left Ventricular Dysfunction
MAO	Mono-amine Oxidase
MI	Myocardial Infarction
mg	Milligram
mL	Milliliter
Mm	Millimeter
mmHg	Millimeter mercury
MRA	Magnetic Resonance Angiography
NANC	Non Adrenergic Non Cholinergic
nNOS	Neuronal Nitric Oxide Synthase
NO	Nitric Oxide
NPTR	Nocturnal Penile Tumescence and Rigidity
NPV	Negative Predictive Value
PA	Postero-anterior
PANPI	Pelvic Angiography in Non-responders to Phosphodiesterase-5 Inhibitors
PDE-5	Phosphodiesterase-5
PG	Prostaglandin
PPV	Positive Predictive Value
PSA	Prostate Specific Antigen
PVD	Peripheral Vascular Disease
QA	Quantitative Analysis
REM	Rapid Eye Movement
ROC	Receiver Operating Characteristic
SBP	Systolic Blood Pressure
sec	second
SMA	Superior Mesenteric Artery
SSRIs	Selective Serotonin Reuptake Inhibitors

TCA	Tricyclic Antidepressants
TCT	Transcatheter Cardiovascular Therapeutics
TIA	Transient Ischemic Attacks
USA	United states of America
VCD	Vacuum Constriction Devices

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Introduction

Erectile dysfunction (ED), defined as the inability to produce or maintain an erection for sexual intercourse, is a common medical problem affecting approximately 15% of men each year. It is strongly related to both physical and psychological health status.[1]

Recently, ED has been associated with the standard cardiovascular (CV) risk factors and has been proposed to be considered an early manifestation of atherosclerotic arterial insufficiency. Furthermore, ED has been proposed to be a coronary artery disease (CAD) risk equivalent, similar to the case with peripheral vascular disease or diabetes. ED shares many risk factors with CAD such as hypertension, diabetes mellitus, hyperlipidemia, obesity, depression, sedentary lifestyle, and smoking. Recent studies have shown that diabetic patients with ED are at higher risk of CAD than diabetic patients without ED.[2,3]

Despite its increasing prevalence among older men, ED is rarely due to age-related hypogonadism, and a vascular disorder is present in the majority of the patients. The association between vascular disease and ED has been recognized and well

documented. Indeed, alternation in the vascular hemodynamics (either arterial insufficiency or veno-occlusive dysfunction) is believed to be the most common cause of organic ED. Therefore, ED can be a manifestation of a vascular disease that affects penile arteries and also other vessels such as coronary arteries. This explains the higher incidence of ED among patients with vascular diseases such as MI, cerebro-vascular accident, peripheral vascular disease, and hypertension compared to the general population.[4]

Recent studies have shown that ED is present in 42% to 75% of men with CAD. It is speculated that ED manifests prior to CAD and consequently, it can be an index of subclinical CAD. It has been shown that a considerable number of men with ED have a silent CAD, and the degree of ED has a relationship with the severity of CAD. However, since ED is a common disease among middle-aged men, it is not rational to always intensively investigate CAD in these patients or to consider them as high risk for CAD, yet. Further evidence is required to correlate ED and its degree with different stages of CAD.[5]

Rogers and colleagues have already completed a pilot study, called the **Pelvic Angiography in Non-Responders to PDE-5 Inhibitors** (PANPI), which correlated angiographic evidence of coronary disease with pudendal arterial disease. In PANPI, 10

patients undergoing coronary angiography for CAD symptoms who also reported a poor response to PDE-5 inhibitors underwent a pelvic angiogram as well. Results showed that stenosis in the coronary arteries typically mirrored that of the pudendal artery, which ranged from a mean of 52% in the right internal pudendal artery to 60% in the left.[6]

AIM OF THE WORK

To investigate the association of pudendal artery disease, by pelvic angiography, and angiographically documented coronary artery disease in diabetic patients with history of erectile dysfunction.