A CASE SERIES STUDYING LESION CHARACTERISTICS AS A PREDICTOR FOR SECONDARY STENTING AFTER SUPERFICIAL FEMORAL ARTERY BALLOON ANGIOPLASTY

Thesis

Submitted in partial fulfillment of

M.D. degree in vascular Surgery

By

Ehab Mohamed Nabil Mohamed Mohamed

M.B.,B.Ch.,M.Sc.

Under Supervision of

Prof. Tarek Ahmed Adel Abdel Azim

Professor of general & vascular surgery

Faculty of medicine - Ain Shams University

Dr. Atef Abdel Hameed Desokey

Assisstant Professor of general & vascular surgery

Faculty of medicine - Ain Shams University

Dr.Ramez Mounir Wahba

Lecturer of general & vascular surgery

Faculty of medicine - Ain Shams University

Faculty of medicine

Ain Shams University

2015

Acknowledgement

Above all and first of all thanks to ***Allah.***

I would like to express my sincere thanks and deepest gratitude to my great teacher, Prof. ***Tarek Ahmad Adel Abd El-Azim*** *professor of vascular surgery faculty of medicine, Ain-Shams university, who suggested the topics and offered me the useful guidance and kind criticism and for all things in my career..*

I am deeply grateful to assistant ***Atef Abdel Hameed Desouki*** *assistant professor of vascular surgery faculty of medicine, Ain-Shams university, for his great help and cooperation.*

A special note of gratitude goes to ***Dr. Ramez Mounir Wahba*** *lecturer of vascular surgery faculty of medicine, Ain-Shams university for his guidance and valuable supervision of this work.*

Finally, my deepest thanks to ***my family*** *that gives me a lot and get a little.*

Contents

List of appreviations

ABI	ankle-brachial index
BA	Ballon Angioplasty
CFA	Common femoral artery.
CLI	Critical limb ischaemia
CT	computed tomography
DES	drug-eluting stents
FAST	Femoral Artery Stenting Trial
FDA	Food and Drug Administration
HDL	high-density lipoprotein
IC	intermittent claudication
IDDM	insulin-dependent diabetes mellitus
IDL	intermediate-density lipoprotein
Laci	The Laser Atherectomy for Critical Ischaemia
LAO	Left anterior oblique
LDL	low-density lipoprotein
MRA	Magnetic Resonance Angiography
NIDDM	non insulin-dependent diabetes mellitus
NO	nitric oxide
OD	Outer diameter
PACS	Picture archiving and communication system
PAD	peripheral arterial disease
PELA	The Peripheral Excimer Laser Angioplasty

PFA	Profunda femoris artery
PTA	percutaneous transluminal Angioplasty
PTX	Paclitaxel
PVD	Peripheral vascular disease
SFA	Superficial femoral artery
SIA	Subintimal angioplasty
SMCs	smooth muscle cells
TASC	The Trans-Atlantic Inter-Society Consensus
VLDL	very-low-density lipoprotein

INTRODUCTION

Peripheral arterial disease (PAD) is a common manifestation of atherosclerosis. The prevalence of PAD continues to increase, with recent data suggesting that almost 30% of at-risk populations have PAD (***Michael R., 2002*).**

Peripheral arterial disease (PAD) affects 12-20 % of population age 65 and older. The Prevalence increases dramatically with age and is associated with significant morbidity and mortality. Despite its prevalence and cardiovascular risk implications, only 25 % of PAD patients are undergoing treatment ***(McDermott et al., 2004).***

The risk factors for PAD are similar to those for coronary heart disease, although diabetes and cigarette smoking are particularly strong risk factors for PAD (***Becker et al., 2002).***

In the general population, only about 10 % of persons with PAD have the classic symptoms of intermittent claudication (IC). About 40 % do not complain of leg pain, while the remaining 50 % have a variety of leg symptoms different from classic claudication. Persons with PAD have impaired function and quality of life. This is true even for persons who do not report leg symptoms **(*Murabito et al., 2005).***

Critical lower limb ischemia, which is characterized by rest pain with or without tissue loss (ulcer, gangrene) is a substantial health burden in the ageing population, and in many developed countries it is associated with an increased prevalence of diabetes. The goals of treatment are: to provide pain relief, promote wound healing, and preserve limb function, whilst minimizing overall cardiovascular risks. These goals help maintain independence and quality of life. They are best attained by limb revascularization whenever possible, as the risk of limb loss within 1 year -if left untreated- is estimated to be 70% in the presence of rest pain and 95% if there is tissue loss. Traditionally managed by risk factor modification and surgical revascularization, the current treatment has undergone a shift in management within these paradigms to include more aggressive endoluminal therapy (***Dormandy &Rutherford, 2000).***

On the other hand, the femoropopliteal segment remains the most challenging area with respect to recurrence after endovascular treatment. The superficial femoral artery is the longest artery in the human body and it is fixed between two major flexion points, the hip and the knee. During movements, like walking or stair climbing, various forces are exerted on this vessel including flexion, longitudinal and lateral compression and torsion. Furthermore, the artery goes through a major muscle group at the site of the Hunter's canal, leading to additional external compression during muscular workout ***(Rogers & Laird, 2007).***

The alternatives for treatment of PAD are rapidly expanding. These new options include pharmacotherapy, improved surgical techniques, and endovascular therapy (***Michael R., 2002*****).**

Endovascular surgery has been proposed as a safe, effective and less expensive alternative to lower extremity arterial bypass surgery for treating critical limb ischemia and claudication. The less invasive nature of the endovascular surgery and the reports of excellent patency in selected cases have resulted in increasing the use of this modality as a primary treatment of lower extremity arterial stenoses and occlusions **(*Richard et al., 2000).***

AIM 0F THE WORK

The aim of this work is to outline lesion characteristics as a predictor for secondary stenting after superficial femoral artery balloon angioplasty.

ARTERIAL WALL ANATOMY

An artery consists of three histologically discrete concentric layers. The inner most, luminal part of the artery, the intima, contains a densely adherent monolayer of endothelial cells, bound together by tight junctions, which provide a barrier that strictly control the entrance of substances to the arterial wall ***(Christopher et al., 2010).***

The endothelial cell layer is adherent to the internal or basal elastic lamina, a network of areolar and elastic tissue. This layer is more marked in the medium size and larger arteries. The media contains vascular smooth muscle cells arranged in a closely adherent monolayer or multiple layers depending on the size of the artery ***(Christopher et al., 2010).***

The adventitia is the outer coat of the vessel, and consists of connective tissue, nerves and vessel capillaries. It links the vessels to the surrounding tissues ***(Gartner & Hiatt, 1997)***

Large elastic arteries

The aorta and its largest branches (common carotid, subclavian and common iliac arteries) are large elastic arteries which conduct blood to the medium-sized distributing arteries. The intima is made of an endothelium, resting on basal lamina, and subendothelial connective tissue layer. The endothelial cells are flat, elongated and polygonal in outline, with their long axes parallel to the direction of blood flow. The subendothelial layer is well developed, contains elastic fibers and type I collagen fibrils, fibroblast and smooth muscle- like myointimal cells. The latter accumulate lipid with age and in an extreme form, this feature contributes to atherosclerotic changes in the intima. Thickening of the intima progresses with age and is more marked in the distal

than in the proximal segment of the aorta ***(Gartner & Hiatt, 1997).***

A proximal internal elastic lamina, sometimes split, lies between intima and media. This lamina is smooth, and with the elastic lamellae of the media, is stretched under the effect of the systolic pressure, recoiling elastically in diastole. The media has a marked layered structure, in which fenestrated layers of elastin (elastic lamellae) alternate with interlamellar muscle cells, collagen and fine elastic fibers. The arrangement is very regular, such that elastic lamella and adjacent interlamellar zone is regarded as a ; lamellar unit; of the media. In the human aorta there are 52 lamellar units ***(Gartner & Hiatt, 1997).***

The adventitia is well developed. In addition to collagen and elastic fibers, it contains flattened fibroblast with extremely long thin processes, macrophages and mast cells, nerve bundles and lymphatic vessels. The vasa vasorum are usually confined to the adventia ***(Gartner & Hiatt, 1997).***

FUNCTIONAL MICROSTRUCTURE OFVESSELS:

INTIMA

The intimal lining of the blood vessels consist of an endothelium, and a variable amount of subendothelial connective tissue, depending on the vessel ***(Crossman, 2005).***

Endothelium

The endothelium is a monolayer of flattened polygonal cells which extends continuously over the luminal surface of the entire vascular tree. Its structure varies in different regions of the vascular bed ***(Crossman, 2005).***