Retrograde Approach as an Alternative to Antegrade Approach in Peripheral Arterial Angioplasty for Treatment of Critical Lower Limb Ischemia

THESIS

Submitted in Partial Fulfillment of Master Degree in General Surgery

By

Mohamed ElSayed Ahmed Hassan

M.B.B.Ch., Faculty of Medicine – Mansoura University

Under supervision

Prof. Dr. Alaa Abdulhamid ElAshry

Professor of General Surgery

Faculty University - Ain Shams University

Dr. Ramez Mounir Wahba

Assistant Professor of Vascular Surgery

Faculty University - Ain Shams University

Dr. Hamdy Abdelazeem Abo ElNeel AbdelHameed

Lecturer of Vascular Surgery

Faculty University - Ain Shams University

Faculty of Medicine

Ain Shams University

2019

Acknowledgment

I would like to express my deep gratitude to my teacher and mentor

Dr. Mohamed Riad Warda

Consultant of Vascular Surgery

the operator of the cases used in this study, for his continuous support, valuable advice, and assistance throughout this work.

LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ALI	Acute limb ischemia
ABI	Ankle-Brachial Index
ABPI	Ankle-brachial Pressure Index
ATA	Anterior Tibial Artery
BEST-CLI	Best Surgical Therapy in Critical Limb Ischemia
CBC	Complete Blood Count
CFA	Common Femoral Artery
CIA	Common Iliac Artery
CLI	Critical Limb Ischemia
CRPS	Complex regional pain syndrome
CSLI	Chronic subcritical limb ischemia
CTA	Computed Tomography Angiography
DM	Diabetes Mellites
DPA	Dorsalis Pedis Artery
DSA	Digital Subtraction Angiography
DUS	Duplex Ultrasound

EIA	External Iliac Artery
IVUS	Intravascular ultrasound
LDL	Low-density Lipoproteins
MDCTA	Multidetector Computed Tomography Angiography
MI	Myocardial Infarction
MRA	Magnetic Resonance Angiography
NSF	Nephrogenic systemic fibrosis
PAD	Peripheral Arterial Disease
PTA	Posterior Tibial Artery
SBP	Systolic Blood Pressure
SFA	Superficial Femoral Artery
SMC	Smooth Muscle Cells
TBI	Toe-Brachial Index
TcPo2	Transcutaneous Oxygen Pressure
US	Ultrasound
WIfI	Wound, Ischemia, foot Infection

INTRODUCTION

Peripheral arterial disease (PAD) is a group of disorders that characterized by narrowing or occlusion of the lower limb arteries resulting in a gradual reduction of blood perfusion to the limbs. ***(Jude et al., 2010)***

Peripheral arterial disease (PAD) is a worldwide problem that has the potential to cause loss of limb or even loss of life. ***(Amer et al., 2013).*** The prevalence of this vascular global problem in the general population is about 12–14%, affecting up to 20% of those >70 years old. ***(Shammas, 2007).*** The process of aging increases the symptomatic PAD incidence from about 0.3% per year in men aged 40–55 years to about 1% per year in those over 75 years. ***(Coni et al., 2002).*** In the 21st century, it became a clear problem in developing countries, which needs to be addressed. ***(Fowkes et al., 2013).*** The prevalence of PAD is equal in both genders. ***(Regensteiner et al., 2002)***

PAD manifests as insufficient tissue perfusion. The progress of the disease is contributed to risk factors such as diabetes

mellitus, hypertension, smoking, hyperlipidemia, and lack of exercise. ***(Shammas, 2007).***

Patients with PAD commonly suffer from ischemic heart diseases and visceral and cerebrovascular insufficiency. It is estimated that less than one-third of them will need intervention for their limbs, surgical or radiologic. However, studies show that patients with symptomatic PAD have at least a 30% risk for death from myocardial infarction or cerebrovascular disease within five years. Therefore, peripheral arterial diseases considered as an independent risk factor for cardiovascular death. ***(Scrutinio et al, 2008).***

Diabetes mellitus (DM) is a significant independent risk factor for PAD, together with hypertension, cardiovascular disease, hyperlipidemia, smoking, and obesity. ***(Dormandy et al, 2009)*** The prevalence of PAD in people with diabetes has been reported to be as high as 30%, and it is known to have a negative impact on health-related quality of life as a result of chronic pain, intermittent claudication, and loss of mobility and function. ***(Ribu et al., 2009)*** Considering that between 120 and 140 million people suffer from diabetes mellitus worldwide and

they are at excess risk of developing PAD, ***(Hoyt, 2004)*** the implications of this problem are huge.

The overall prevalence of peripheral arterial disease (PAD) is in the range of 3%-10%. This prevalence is markedly increasing with a rising in age, as it becomes about 15%-20% in persons older than 70 years. About this upward trend in the prevalence of this disease, the economic and societal burden of PAD would be considerable. The subgroup of patients who develop critical lower limb ischemia represents the most challenging population to manage medically, endovascularly, and surgically. ***(Dua et al, 2016).***

Patients with symptomatic PAD and critical limb ischemia (CLI) have an increased risk for death and cardiovascular insults, especially in those with CLI who carry a high risk of limb loss. Advances in therapeutic modalities; medical, surgical, and endovascular techniques have shown excellent outcomes in those patients. ***(Dua et al., 2016).***

Patients suffering from chronic lower limb ischemia are usually high-risk surgical patients because of their many co-morbidities. ***(Norgren et al., 2007).*** Therefore, open surgical revascularization is not suitable for many of them. Fortunately,

percutaneous angioplasty offered a suitable treatment option for this group of patients as it performed under local anesthetic infiltration. ***(Mustapha et al., 2014).*** Furthermore, for patients with infra-popliteal occlusive disease, percutaneous endovascular intervention has become the first option of treatment for these challenging lesions. ***(Wiechmann, 2012).***

During angioplasty, multiple options for arterial access are available. The most commonly used site is the common femoral artery, through ipsilateral or contralateral cross-over. If the common femoral artery (CFA) access is not suitable, alternatively, a retrograde ipsilateral approach can be used through the distal superficial femoral artery (SFA), popliteal, tibials, or the dorsalis pedis arteries. Another use for the retrograde technique is the inability to return to the true lumen after creation of a subintimal plane during trials to pass the wire. The suggested re-entry devices are expensive and their use is complicated. Therefore, they can be replaced by different retrograde approaches. ***(Montero-Baker et al., 2008).***

Popliteal artery access from a retrograde approach has grown in use as an alternative to antegrade crossing of SFA occlusions through femoral puncture. ***(Evans et al., 2010).*** The dis-advantage of the need to change the patient's position in this

retrograde approach is overcome now by performing the procedure while the patient is supine. However, it is suitable only for SFA lesions but not when coexistence of other lesions. ***(El-Maadawy et al., 2015).***

On the other hand, the retrograde access seems to be a potentially effective alternative for endovascular therapy of infra-inguinal arterial lesions when the antegrade procedure is not suitable. ***(Spinosa et al., 2013), (Reffat et al., 2017)***

AIM OF THE WORK

The aim of this study is to determine the feasibility (technically and outcome) of retrograde approach after failure of antegrade technique in peripheral arterial angioplasty for the treatment of critical lower limb ischemia.