Comparison between Reconstruction and Conventional Grafting of the Diffusely Atherosclerotic Left Anterior Descending Artery

Thesis

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By

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Mukhtar Gamal

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List of Abbreviations

Abb.	Description
ACC	American College of Cardiology
ACS	Acute coronary syndrome
AHA	American Heart Association
ASIST	Atenolol Silent Ischemia Study
BARI	Bypass Angioplasty Revascularization Investigation
CABG	Coronary artery bypass graft
CCS	Canadian Cardiovascular Society
CCTA	Coronary computed tomography angiography
CE	Coronary endarterectomy
CPB	Cardiopulmonary bypass
cTnI	Cardiac troponin I
CVA	Cerebrovascular accident
CVP	Central venous pressure
ECG	Electrocardiography
EF	Ejection fraction
IABP	Intra-aortic balloon pump
ICU	Intensive care unit
IL	Interleukin
IMA	Internal mammary artery
IVUS	Intravascular ultrasonography

Abb.	Description
LAD	Left anterior descending
LDL	Low density lipoprotein
LIMA	Left internal mammary artery
LVF	Left ventricular function
LVEF	Left ventricular ejection fraction
MDCT	Multi-detector computed tomography
MI	Myocardial infarction
MMPs	Matrix metalloproteinases
PTCA	Percutaneous transluminal coronary angioplasty
RA	Radial artery
RGEA	Right gastroepiploic artery
RIMA	Right internal mammary artery
SD	Standard deviation
SMCs	Smooth muscle cells
SWM	Segmental wall motion
SWMA	Segmental wall motion abnormality
TEE	Transesophageal echocardiography
TNF	Tumor necrosis factor

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Introduction

Revascularization of the diffusely diseased coronary artery is a big challenge for both interventional cardiologists and cardiac surgeons. *(1)*

With the increased use of percutaneous interventions by invasive cardiologists, the number of high-risk and elderly patients referred for Coronary artery bypass grafting (CABG) operation has increased. *(2)*

CABG significantly increases life expectancy and improves quality of life, and complete myocardial revascularization should be the main goal of the surgical intervention. *(3)*

The internal mammary artery (IMA) has been proven to be the best conduit for CABG, with excellent long-term patency rates and better patient outcomes than with other conduits. The best prognosis is achieved with complete revascularization using the IMA grafted to the left anterior descending artery (LAD). *(4)*

In cases with a diffusely diseased coronary artery in the LAD territory, complete revascularization cannot be obtained by conventional grafting to the distal LAD alone, because side branches diverging from the diseased segments would not be perfused. *(5)*

A diffusely diseased LAD is characterized by the presence of multiple stenoses downstream from the first major proximal lesion. In patients with such lesion, a long-segmental LAD reconstruction was performed by covering the arteriotomy with saphenous vein as onlay graft. *(6)*

Long reconstruction is one of the coronary artery bypass grafting methods for treating severely or diffusely diseased coronary arteries. The greatest advantage of this method is that the myocardium supplied by the side branches of the diffusely diseased coronary artery can be revascularized simultaneously. [7]

Previous experience with coronary endarterectomy for diffusely diseased coronary arteries has been limited due to poor clinical results in the early years. More recently, however, the benefits of LAD endarterectomy have been gradually recognized because surgical techniques and technologies have evolved. Furthermore, coronary artery reconstruction with an exclusion of plaque has also been performed for diffusely diseased LAD. [8]

Coronary endarterectomy has been shown to be an effective adjunctive technique of revascularization for diffuse coronary artery disease. A long arteriotomy and reconstruction of the LAD are occasionally required for complete extraction of the atherosclerotic plaque. [9]

Aim of the Work

The aim of this study is to compare between long segmental reconstruction of the diffusely atherosclerotic LAD using saphenous vein patch with or without endarterectomy and conventional grafting by following the short term clinical outcome.

Historical Background

Dr. Ludwig Rehn, a surgeon in Frankfurt, Germany, performed what many consider the first successful heart operation. After repairing the first cardiac wound in 22 year old gardener he stated that: This proves the feasibility of cardiac suture repair without a doubt I hope this will lead to more investigation regarding surgery of the heart. This may save many lives. ***(10)***

In 1876 Adam Hammer established that angina pain could be attributed to interruption of coronary blood supply and that heart attacks occurred when at least one coronary artery is blocked. ***(11)***

Indirect methods to restore blood supply to the ischemic myocardium were pioneered by *Claude Beck (1935)* who reported the placement of a pedicled pectoralis muscle flap on the abraded epicardium.

Surgical attempts at increasing blood flow to the ischemic myocardium originated century ago when Alexis Carrel anastomosed a carotid artery segment between the descending aorta and left coronary artery in a dog, for which he was later awarded the Nobel prize. ***(12)*** The earlier surgical attempts to improve myocardial blood supply were indirect procedures. Cervical sympathectomy was suggested as a method of cardiac denervation and reduction of heart rate. ***(13)***

Three decades later, Arthur Vineberg started implanting the left internal mammary artery (LIMA) into