Prognostic Impact of Previous Stenting on Outcome of CABG in Multivessel Disease Patients.

Thesis.

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ACC	Aortic cross clamp
AF	Atrial Fibrillation
AHA	American Heart Association
BMS	Bare Metal Stent
CA	Coronary angiography
CABG	Coronary Artery Bypass Grafting
CCS	Canadian Cardiovascular Society Angina Classification
CPB	Cardiopulmonary Bypass
DES	Drug Eluting Stent
ECG	Electrocardiography.
ESD	End systolic dimension
EDD	END diastolic dimension
EF	Ejection Fraction
IABP	Intra Aortic Balloon Pump.
ICU	Intensive Care Unit
INR	International Normalized Ratio.
LAD	Left Anterior Descending artery.
LIMA	Left Internal Mammary Artery
LM	Left Main Coronary artery
MACE	Major Adverse Cardiac Events
MAX	Maximum
MIN	minimum
MI	Myocardial infarction
NYHA	New York Heart Association.
OPCAB	Off-Pump Coronary Artery Bypass
PCI	Percutaneous Coronary Intervention.
PTCA	Percutaneous Transluminal Coronary Angioplasty
SD	Standard Deviation

Abstract

Back ground:

The number of percutaneous coronary interventions (PCI) prior to coronary artery bypass grafting (CABG) increased drastically during the last decade. Patients are referred for CABG with more severe coronary pathology, which may influence postoperative outcome.

Methodology:

Outcomes of 50 CABG patients, collected by a Prospective comparative study, were compared. Group A (n = 25, mean age 53.88 years, 4 women) underwent primary CABG and group B (n = 25, mean age 51.36 years , 4 women) had prior PCI before CABG .

Results:

Total morbidity was significantly higher in the second group than the first group where 5 patients in group A (non stent group) were affected, while 13 patients were affected in group B (stent group). Inotropes were found to be used more with the previous PCI group rather than group A. ICU stay was longer for group B (53.68 ± 31.45 hrs vs 72.56 ± 54.44 hrs).

Conclusion :

Previous PCI may has a negative impact on the outcome of subsequent CABG regarding morbidity. However there was no difference in the postoperative mortality.

Percutaneous Coronary revascularization should be carefully considered against the higher risk it provides for subsequent CABG. The guidelines for intervention should be strictly followed especially in patients with complex coronary lesions who have higher incidence to be referred for CABG.

Study limitations:

The number of enrolled patients limits the explanatory power of our study. It is plausible to study the long term outcome to complete the results of short term outcome

Key words:

Previous stenting before CABG.

Introduction and Aim of The Work

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Despite all scientific evidences and the guidelines for the treatment of chronic coronary artery disease demonstrating the benefits of coronary artery bypass grafting (CABG), especially in patients with multivessel disease, there has been an exponential growth in percutaneous coronary intervention (PCI) with stents Since Gruntzig introduced it in 1977 , With technological advances and the experience accumulated over the years, the indication for PCI has expanded and procedures in multivessel coronary disease have become more common , Its " less invasiveness " is more attractive to patients . Around one-third of patients with multi-vessel disease treated with bare metal stents will require re-intervention within few year ***(Hannan et al., 2005).***

In this so-called "stent era", patients with coronary artery disease and class I indication for CABG are frequently submitted to PCI as initial alternative, before being convinced to surgical treatment. several studies have been published comparing the outcomes of CABG and PCI as the primary treatment for coronary artery disease. Beside the increase of age and co-morbidity, there are an increasing number of patients with a previous successful PCI in the present population of patients undergoing CABG ***(Van den Brule et al., 2005).***

With technological advances and changes in clinical practice, the respective values of coronary artery bypass surgery and percutaneous coronary intervention needed to be reassessed. The SYNTAX multicenter prospective randomized trial is an attempt to provide an evidence base to determine the best treatment option for patients in a real-world population seen by the surgeon and the interventional cardiologist in their daily practice ***(Kappetien et al., 2010).***

These studies clearly demonstrated that there was no difference between the two therapeutic modalities regarding mortality and non fatal myocardial infarction but patients treated with stenting wether bare metal stent or drug eluting stent required more often to repeat revascularization procedures related to restenosis ***(Hoffman et al., 2003).***

The expanding indications for angioplasty have already had an unquestionable impact on the practice of coronary revascularization. Many patients are still referred for surgery owing to either the occurrence or threat of stent restenosis, which occurs with an average frequency of approximately 20-40% in the last decade, percutaneous coronary intervention (PCI) has undergone profound changes in techniques used to achieve revascularization and in patient selection ***(Sianos et al., 2005).***

It is supposed that patients with a previous PCI are at higher risk for CABG. However, only a few studies are available and contradictory: some authors suggest that initial PCI may complicate the operation and may increase postoperative morbidity and mortality, Others describe no difference in postoperative morbidity and mortality ***(Haan et al., 2006).***

There is a low but real need for emergent CABG after PCI, in which operative outcomes are less than ideal, especially in the post infarction patient, representing an area for cross-specialty collaboration ***(Kanemitsu et al., 2007).***

Aim of The work

In the current era of stent usage, percutaneous coronary intervention is more frequently performed as the initial revascularization strategy in multivessel disease before patients are finally referred to CABG ; We sought to determine whether previous PCI has a prognostic impact on outcome in multivessel disease patients, so the aim of this study is to study the prognostic impact of previous stenting on outcome of CABG in multivessel disease Patients.

Historical background

The first detailed account of the angina pectoris given by a medical person was by Dr. William Heberden (1710-1801) in the 18th century. He used the term Angina Pectoris (Pectoris Dolor) for the first time to describe a syndrome characterized by a sensation of "strangling and anxiety" in the chest ***(Grech and Ramsdale, 2002).***

Coronary catheterization was first performed when Werner Forssmann, in 1929, created an incision in one of his left antecubital veins and inserted a catheter into his venous system. He then guided the catheter by fluoroscopy into his right atrium ***(Forssmann, 1929.)***

In the early 1940s, André Cournand, in collaboration with Dickinson Richards, performed more systematic measurements of the hemodynamics of the heart. For their work in the discovery of cardiac catheterization and hemodynamic measurements, Cournand, Forssmann, and Richards shared the Nobel Prize in Physiology or Medicine in 1956 ***(Cournand et al., 1975)***.

Dawn of the interventional era

Andreas Gruntzig performed the first successful percutaneous transluminal coronary angioplasty (known as PTCA or percutaneous coronary intervention (PCI)) on a human on September 16, 1977 at University Hospital, Zurich ***(King SB 3rd et al., 1996).***

Development of the intracoronary stent

The first intracoronary stents were successfully deployed in coronary arteries in 1986 ***(Palmaz et al., 1985).***

The drug eluting stent era

With the high use of intracoronary stents during PCI procedures, the focus of treatment changed from procedural success, to prevention of recurrence of disease in the treated area (in-stent restenosis).

One of the first products of the new focus on preventing late events (such as in stent restenosis and late thrombosis) was the heparin coated Palmaz-Schatz stent ***(Gupta et al., 2004).***

Concurrent with the development of the Cypher stent, Boston Scientific started development of the Taxus stent. The Taxus stent was the Express metal stent, As with the Cypher stent before it, the first trials of the Taxus stent revealed no evidence of in-stent restenosis at six months after the procedure, while later studies showed some restenosis at a rate much lower than the bare metal counterpart ***(Grube et al., 2003).***

By the end of 2004, drug eluting stents were used in nearly 80 percent of all percutaneous coronary interventions ***(Maisel et al., 2007).***

History of Development of CABG

The first coronary artery bypass surgery was performed in the United States on May 2, 1960, by a team led by Dr. Robert Goetz and the thoracic surgeon, Dr. Michael Rohman with the assistance of Dr. Jordan Haller and Dr. Ronald Dee. In this technique the vessels are held together with circumferential ligatures over an inserted metal ring. The internal mammary artery was used as the donor vessel and was anastomosed to the right coronary artery. The actual anastomosis with the Rosenbach ring took fifteen seconds and did not require cardiopulmonary bypass. The disadvantage of using the internal mammary artery was that, at autopsy nine months later, the anastomosis was open, but an atheromatous plaque had occluded the origin of the internal mammary that was used for the bypass ***(Haller and Olearchyk, 2002).***

Russian cardiac surgeon, Dr. Kolesov, performed the first successful internal mammary artery–coronary artery anastomosis in 1964.

However, Goetz's has been cited by others, including Kolesov, as the first successful human coronary artery bypass. Goetz's case has frequently been overlooked. Confusion has persisted for over 40 years and seems to be due to the absence of a full report and to misunderstanding about the type of anastomosis that was created. The anastomosis was intima-to-intima, with the vessels held together with circumferential ligatures over a specially designed metal ring. Kolesov did the first successful coronary bypass using a standard suture technique in 1964, and over the next five years he performed 33 sutured and mechanically stapled anastomoses in St. Petersburg, Russia ***(Mehta et al., 2002).***

Dr. René Favaloro achieved a physiologic approach in the surgical management of coronary artery disease - the bypass grafting procedure - at the Cleveland Clinic in May 1967.His new technique used a saphenous vein autograft to replace a stenotic segment of the right coronary artery. Later, he successfully used the saphenous vein as a bypassing channel, which has become the typical bypass graft technique we know today; in the U.S., this vessel is typically harvested endoscopically, using a technique known as endoscopic vessel harvesting (EVH). Soon Dr. Dudley Johnson extended the bypass to include left coronary arterial systems. In 1968, Doctors Charles Bailey, Teruo Hirose and George Green used the internal mammary artery instead of the saphenous vein for the grafting ***(Mehta and Khan, 2002).***

Surgical anatomy of the coronary

A coronary artery is defined as any artery or arterial branch that supplies cardiac parenchyma i.e. any structure within the pericardial cavity, including the myocardium, the semilunar and atrio-ventricular valves, the great vessels and the visceral pericardium or epicardium. The parietal pericardium should not be included, so the pericardial arteries should not be considered coronary ***(Mill et al., 2003).***

They are called the coronary arteries because they encircle the heart in the manner of a crown. The word "coronary" comes from the Latin "corona" and Greek "koron" meaning crown. Like other arteries, the coronaries may be subject to arteriosclerosis.

The right and left coronary arteries originate behind their respective aortic valvar leaflets. The orifices usually are located in the upper third of the sinuses of Valsalva, although individual hearts may vary markedly. Because of the oblique plane of the aortic valve, the orifice of the left coronary artery is superior and posterior to that of the right coronary artery. The coronary arterial tree is divided into three segments; two (the left anterior descending artery and the circumflex artery) arise from a common stem. The third segment is the right coronary artery ***(Mill et al., 2003).***

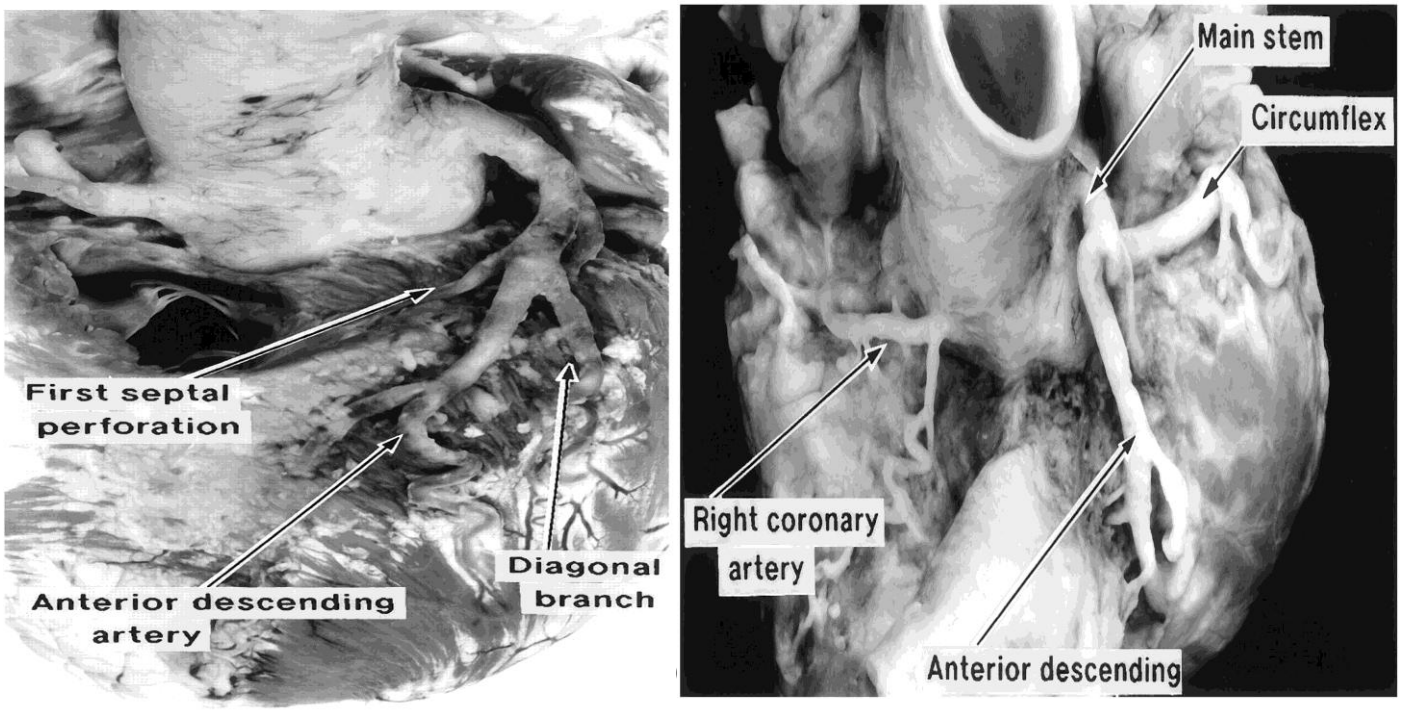

Fig1: photo for anatomy of coronary origins from aorta

System Dominance:

The dominance of the coronary circulation (right versus left) usually refers to the artery from which the posterior descending artery originates, not the absolute mass of myocardium perfused by the left or right coronary artery. Right dominance occurs in 85% to 90% of normal individuals. Left dominance occurs slightly more frequently in males than females ***(Anderson et al., 1980).***

The main stem of the left coronary artery courses from the left sinus of Valsalva anteriorly, inferiorly, and to the left between the pulmonary trunk and the left atrial appendage . Typically it is 10 to 20 mm in length but can extend to a length of 40 mm. The left main stem can be absent, with separate orifices in the sinus of Valsalva for its two primary branches (1% of patients). The main stem divides into two major arteries of nearly equal diameter: the left anterior descending artery and the circumflex artery ***(Kirklin et al., 1993).***

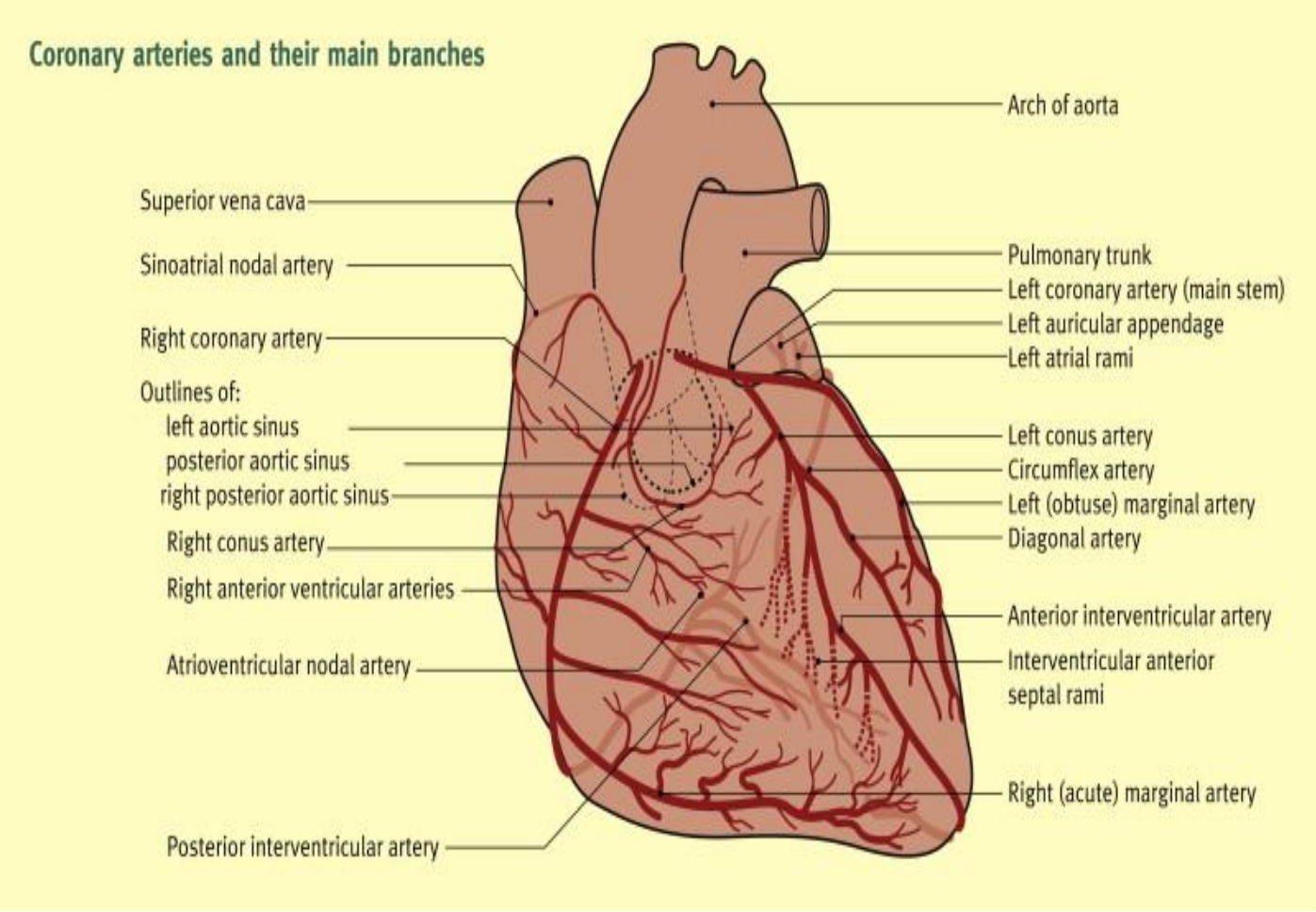

Fig2: diagram for anatomy of coronary arteries and their main Branches,(Quotted from Wikipedia).