RECENT TRENDS IN THE SURGICAL MANAGEMENT OF CORONARY ARTERY DISEASE

AN ESSAY

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BY

SHERIF EL SAYED SILYMAN AZAB

M.B., B.Ch.

UNDER SUPERVISION OF

PROF. DR. ISMAIL A. SALLAM

PROF. OF CARDIOTHORACIC SURGERY

DR. MOHAMED MONIR EL SAEGH

LECTURER OF CARDIOTHORACIC SURGERY

DR. MOHAMED ABDEL AZIZ ALI

LECTURER OF CARDIOTHORACIC SURGERY

FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

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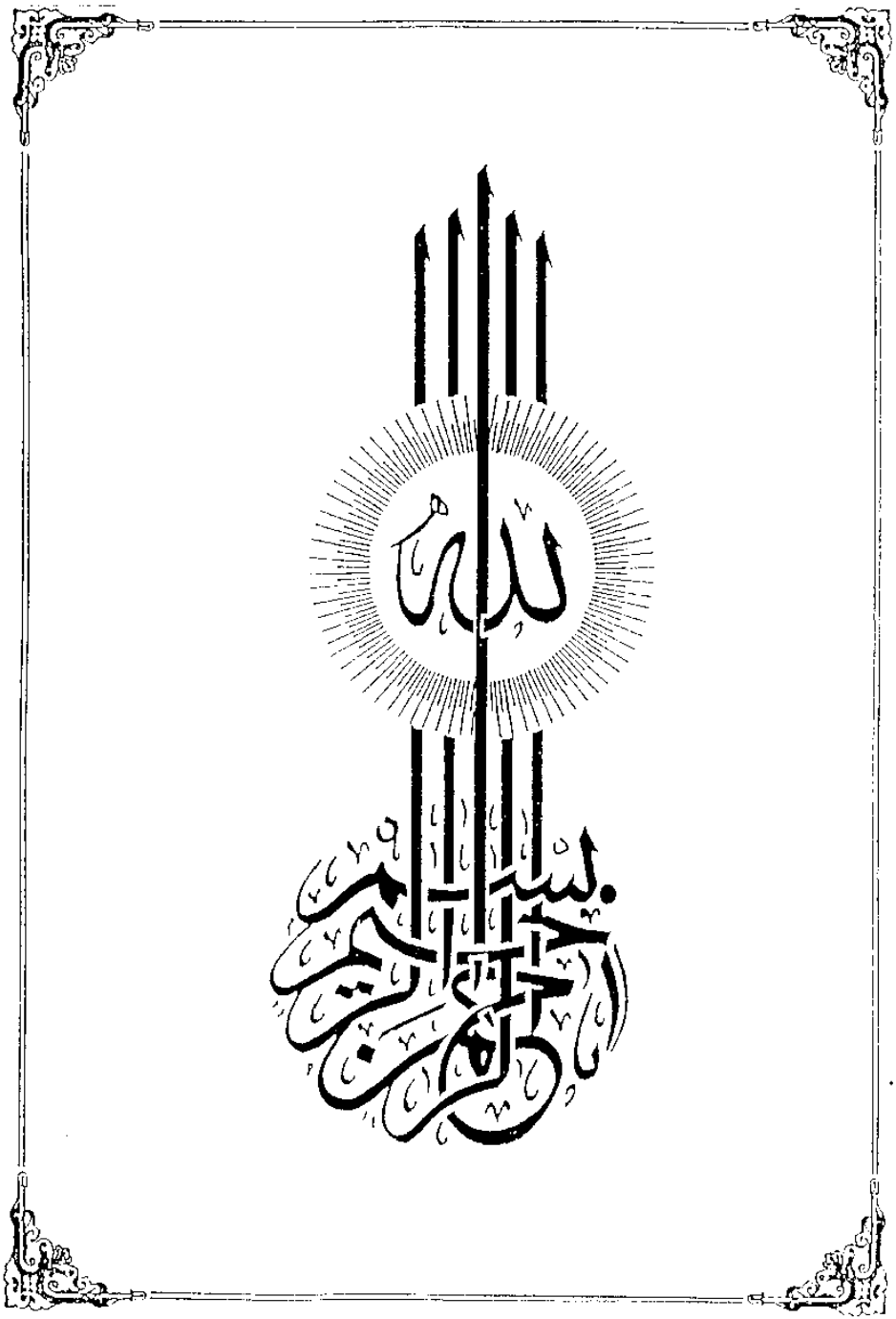
TO THE MEMORY OF MY FATHER



بسم الله الرحمن الرحيم

"قالوا سبحانك لا علم لنا إلا ما علمتنا
إنك أنت العليم الحكيم"

صدق الله العظيم

سورة البقرة - آية ٣٢

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CONTENTS

REVIEW OF LITERATURE

CORONARY ATHEROSCLEROSIS AND CORONARY ARTERY SURGERY

Introduction

Coronary atherosclerosis is a pathologic condition of the coronary arteries characterized by abnormal lipid and fibrous tissue accumulation in the vessel wall with resulting disruption of the vessel architecture and function and variable reduction of blood flow to the myocardium. Atherosclerotic coronary heart disease is among the most serious and costly health problems in industrialized nations and it is a major cause of death . Most sudden deaths in the adult population is of cardiac origin and most sudden cardiac death is due to coronary disease. This sudden death is one of the major clinical manifestations of ischemic heart disease [Bulkley, 1986].

Under basal condition, average cononary blood flow is approximately 80 ml per 100 gm of myocardium per minute. This value is approximately 10 times that observed for the bodyas a whole reflecting the high energy requirements of cardiac muscle. Because O_2 requirements are so high, even short period of ischemia produce significant derangement in cellular metabolism and abnormalities in myocardial function [Rankin & Sabiston, 1983].

The fundamental physiologic defect of coronary atherosclerosis is inadequate oxygen transport to the myocardium manifested initially during period of increased oxygen demand hence the familiar characteristics of angina are that it appears during exercise, eating or emotional stress but subsides with rest. It is a symptom arising from anaerobic metabolism. When occlusive coronary artery disease is more extensive, angina may appear at rest and last for longer period. Such episodes may terminate in either myocardial infarction or death and hence are referred as unstable angina, cresendoangino or preinfarction angina [Spencer, 1983].

Between 1967 and 1968 the coronary artery bypass surgery started. Since then the procedure has become a near routine next step in the management of coronary atherosclerotic heart disease [Bulkley, 1986]. This direct coronary artery surgery by vein or internal mammary artery grafting is the first procedure to produce consistent predictable and prolonged relief of angina.

Today randomized prospective studies of medical versus surgical treatment have shown that bypass surgery is superior to medical management for alleviating or improving angina [Loop, 1983].

Coronary bypass surgery does not arrest the underlying atherosclerotic process in the native coronary arteries as the progression of atherosclerosis is time dependent and the end result is the left ventricular deterioration.

Loop in 1983 stated that coronary artery surgery is not curative but can provide excellent palliation and relative pre'ection from ischemic events in the intermediate term and possibly the long term. There are two major reasons for performing coronary artery surgery: 1) to reduce symptoms regardless the extent of coronary artery disease and 2) to lengthen survival especially in those with left main, tripple and double-vessel disease [Loop, 1983], [Manley, 1986].

Indications of surgery:

Current indications for coronary artery surgery include the following: 1) Stable disabling angina that interfers with desired life style dispit therapy. 2) Angina with left main artery disease, three-vessel or two-vessel disease. 3) sever narrowing of the paoximal anterior descending artery supplying large area of the anterior wall. 4) Recent infarction and repeated episodes of myocardial ischemia. 5) Variant angina with persistant anatomic obstruction. 6) Asymptomatic patients with electrocardiographic or thalium

stress test displaying signs of ischemia at low exertional level [Loop, 1983].

Coronary artery bypass grafting does not appear indicated: 1) in patients asymptomatic or only mildly to moderately symptomatic with single vessel disease 2) In patients with single-vessel disease associated with an uncomplicated left ventricular aneurysm 3) In patients with severe left ventricular dysfunction [ejection fraction less than 20%] whose primary symptom reflects congestive heart failure rather than angina [Manley, 1986].

Coronary artery surgery has shown a sustained benifit in term of fewer cardiac events, decreased symptoms and generally a better quality of life . Also survival after surgical therapy was improved for the whole group of coronary artery disease patients and held true for asymptomatic and mildly symptomatic patients as well as for those with more severe symptoms. The greatest benifit was seen primarily in patients with three-vessel disease and normal and moderatly abnormal left ventricular function [Loop, 1983].

The most important factors which determine late survival are: age at operation, preoperative left ventricular function and the quality of the surgical result, namely perioperative morbidity and mortality, graft patency

and completeness of revascularization [Lawire and Morris, 1978].

Cukingand and Co. workers in [1980] reported that there was a significant difference in angina relief in complete versus incompletely revascularized patients even when all grofts are patent.[Cukingnan et al , 1980]

At present, more than 170,000 patients per year undergo coronary bypass surgery in the united states and by now well over one million patients have had bypass surgery at least once [Bulkley, 1986]. Achievements that have increased the safety of coronary artery surgery include the following: 1) better preoperative management ensuring stability on reaching the operating room. 2) Normalizing adjustments of hemodynamic parameters by cardiac anesthesiologists 3) Myocardial protection via cold chemical cardioplegia. 4) More complete revascularization 5) Blood conservation and 6) improved perioperative monitoring and management [Loop, 1983].

Today the safety and immediate effects and benefits of bypass grafting are will established. Probably varying somewhat with criteria used by different centres, 90 to 95 percent of patients with coronary disease can be operated upon with an operative mortality near one percent in good risk patients [Spencer, 1983].

ANATOMY OF THE CORONARY ARTERIES

Morphological anatomy:

The coronary arteries are variable as Finger prints, although no two coronary angiograms will match if superimposed, definite patterns are established which proved to be of great help to the Cardiologist and surgeon [Ochsner and Mills, 1978]. Most individuals have two coronary arteries [right and left] but separate origin of the infundibular artery from aortic sinus occurs in about 35% of people so that approximately one-third have 3 arteries. Separate origin of the anterior descending and circumflex branches of the left coronary artery is much less common while single coronary artery in rare. The major branches of the coronary arteries are usually subepicardial but the right and circumflex arteries are embeded in fat and the interventricular arteries are often deeply placed and may even be obscured by the myocardium [Myocardial bridges], These bridges have been implicated as a source of myocardial ischemia, but they occur in more than 80% of normal hearts [Allwork, 1984].

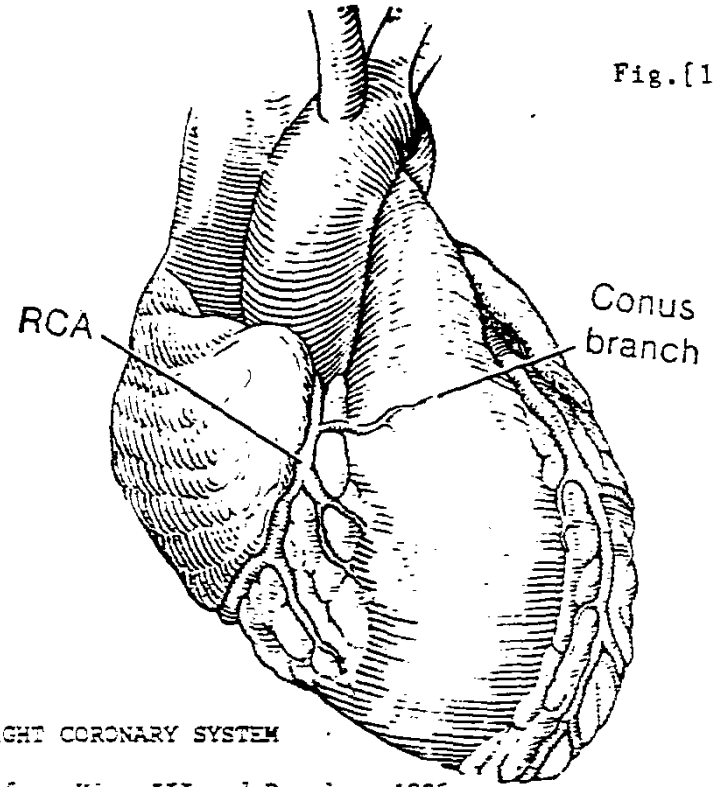
Dominance:

The dominant coronary artery is that which gives the posterior descending branch. Although the left coronary artery always supplies a greater volume of myocardium than does the right, the right coronary artery is dominant in about 90% of hearts. The remainder have either left dominant, the posterior descending branch being the termination of circumflex branch or more rarly both the left and right coronary arteries vascularize the posterior septum to give a balanced circulation [ochsner and Mills, 1978]. So there is a normal anatomic variations that should be recognized since they influence surgical judgement.

The right coronary Artery:

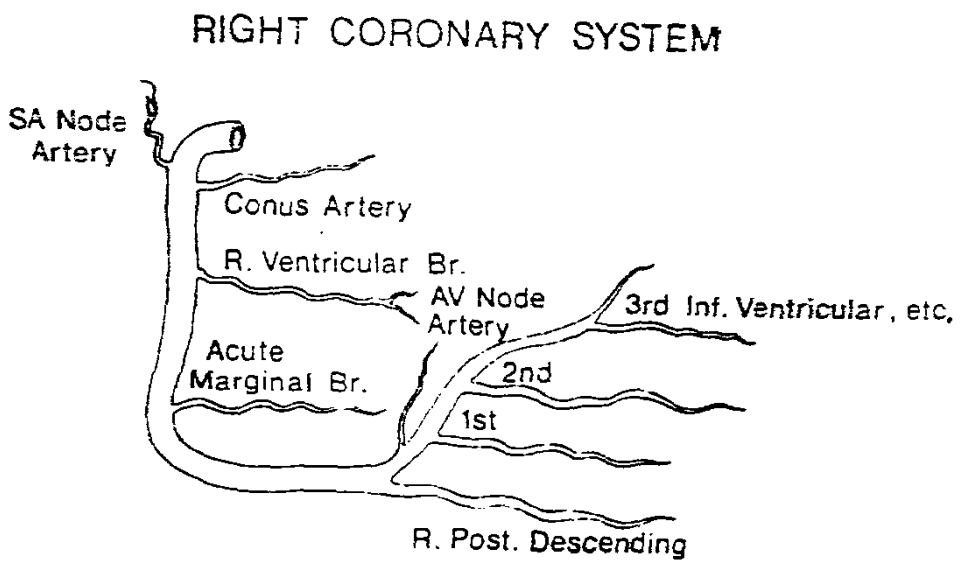
The right coronary artery arises above the anterior cusp of the aortic valve and it then passes beneath the right atrial appendage and courses posteriorly in the right atrioventricular groove until it reaches the crux [The area where the right and left atria and ventricles intersect]. In the right atrioventricular groove it travels as a large conduit vessel and it is almost invariably embeded in fat [epicardial fat] and often somewhat difficult to find even it may run an intracavitary course within the right atrium [King III and Douglas, 1985].

Fig.[1]



RIGHT CORONARY SYSTEM

Anterior view from King III and Douglas, 1985



from Ochsner and Mills, 1978