# *Perioperative assessment of the hand circulation after radial artery harvest for myocardial revascularization*

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*Presented by*

***Waleed Ahmed Shehata Ahmed***
M.B.B.Ch.

*Under supervision of*

***Prof. Dr. Tarek Ahmed Adel Abdel Azim***
Professor of Vascular surgery
Ein Shams University

***Prof. Dr. Ashraf Abdalla Elsebaie***
Asst. Professor of Cardiac surgery
Ein Shams University

***Prof. Dr. Aly Hassan Taher***
Professor of Cardiac surgery
National Heart Institute

***Faculty of Medicine***
**Ein Shams university**
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CABG…..…… Coronary artery bypass grafting.

DP……... Deep palmar arch.

IMA…….……... Internal mammary artery.

LAD……..…. Left anterior descending artery.

RA……..…..... Radial artery .

SV……...… Saphenous vein.

Sp 02……... Oxygen saturation.

SPA …… Superficial palmar arch.

TA……... Thumb artery.

UA…….….. Ulnar artery.

# *INTRODUCTION*

## *HISTORICAL ASPECT*

Comparative morphological and angiographic studies of internal mammary artery (IMA) and saphenous vein bypass grafts that have been implanted long-term show that accelerated atherosclerosis occurs commonly in saphenous vein grafts but is extremely rare in IMA grafts. Several potential explanations may be offered for the superiority of the IMA graft. The media of the artery may derive nourishment from the lumen as well as from the vasa vasorum, and the internal elastic lamina of the IMA is uniform. Moreover, the finding that the endothelium of the IMA produces significantly more prostacyclin than that of the saphenous vein may explain why endothelium-dependent relaxation is more pronounced, which may allow flow-dependent autoregulation to occur. The diameter of the IMA graft is usually a closer match to that of the recipient coronary artery than is the diameter of a saphenous vein the success of IMA grafts has stimulated interest in the use of other arterial conduits, particularly in patients who are younger, diabetic, or hyperlipidemic or in whom the saphenous veins are unsuitable or unavailable. (Braunwald, 2001)

# Chapter I

## Introduction

Due to the high incidence of progressive occlusive disease in saphenous vein grafts after coronary bypass surgery, renewed interest has focused on the use of arterial graft conduits, including the radial artery (RA). The use of the radial artery for coronary artery bypass grafting was first introduced by Carpentier et al in 1971.

At that time the study was conducted with a limited number of patients. Postoperative follow-up angiography showed a high rate of graft failure, and the use of this conduit was completely abandoned after 1976 (Esmore et al, 2000).

Several cases in which a patent RA graft was seen after 15 years with no evidence of graft disease led to the reinvestigation of the use of this conduit for coronary revascularization. Acar and his colleagues again proposed the use of this artery for CABG. Improved surgical harvesting techniques and the administration of antispasmodic drugs have resulted in several groups reporting angiographic patency rates in excess of 90% at one year and up to 90% at five years. (Acar, 1998)

A dramatic rise in RA use occurred during 1996. More than 80% of patients undergoing coronary artery bypass surgery have RA harvested since this time. Total arterial revascularisation rate also rose dramatically and is currently 80% of all CABG. (Alistair. 1999)

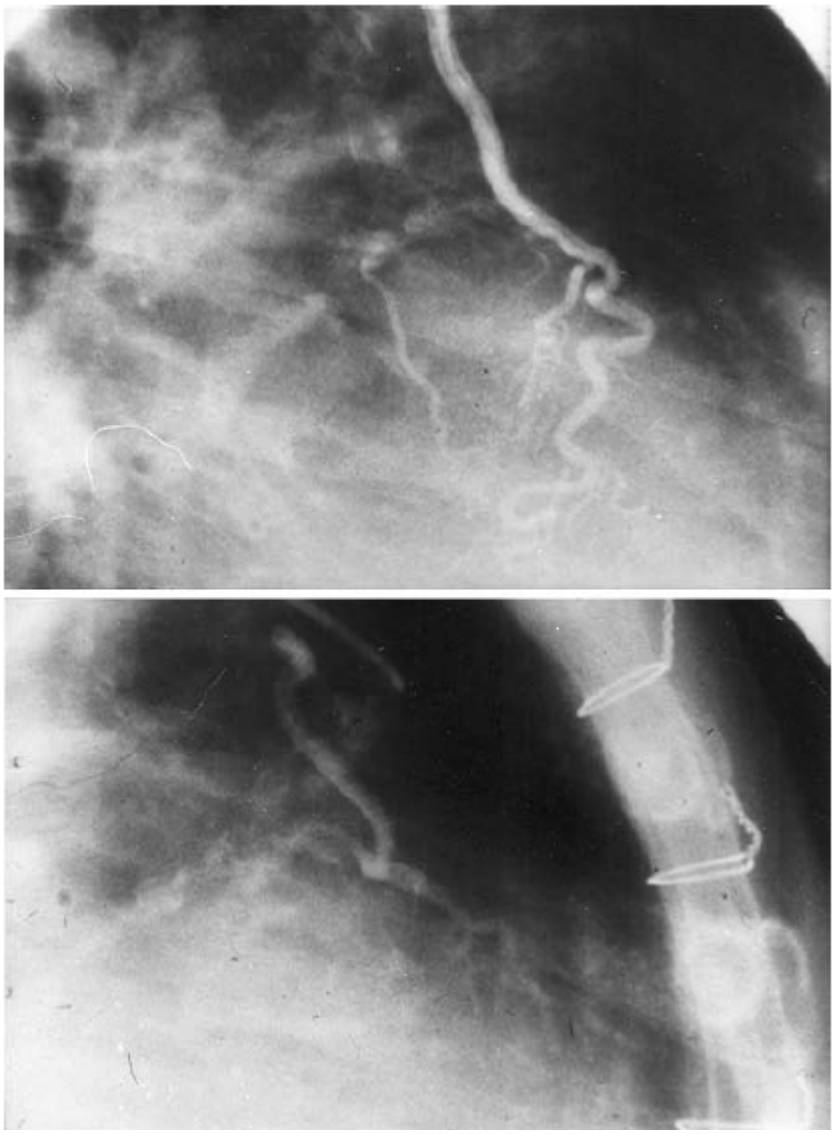

**Fig.1:** *Two radial artery grafts in the same patient followed upat 18 years (Ann Thorac Surg 1992)*

# *ANATOMY OF THE RADIAL ARTERY*

The brachial artery normally divides into the radial and the ulnar arteries at the level of the neck of the radius in the cubital fossa (Romanes, 1982). The radial artery usually appears to be the direct continuation of the brachial artery, whereas the ulnar branches off almost at a right angle (Sinnatamby, 1999)

The smaller RA passes downwards and laterally between brachioradialis and flexor carpi radialis muscles to reach the anterior surface of the distal end of the radius between the tendons of these muscles. Here, the artery can be felt readily (radial pulse) against the bone (Rornanes.1982).

The artery then curls posterolaterally round the carpus, beneath tendons of the abductor pollicis longus, extensor pollicis brevis and longus, to the proximal end of the first inter-metacarpal space, swerving medially between the heads of the first dorsal interosseous into the palm and then crossing medially to form the deep palmar arch with the deep branch of the ulnar artery. The radial artery is thus divided into parts: in the forearm, wrist and hand.

**In** the **forearm:** The artery extends from the medial side of the neck of the radius to the front of its styloid process, being medial to the radial shaft proximally, but anterior to it distally.

**At the wrist:** The radial artery passes on to the dorsal aspect of the carpus; crossing the anatomical snuff-box.

**In the hand:** It crosses the hand and at the fifth metacarpal base it anastomoses with the deep branch of the ulnar artery; completing the deep palmar arch (Gray H, 1995).

Except in the initial part of its course; the artery is immediately deep to the deep fascia. It crosses the superficial surface of pronator teres with the superficial branch of radial nerve (lateral to the artery) (Rornanes, 1982). The vessel is accompanied by paired venae comitantes (Gray H, 1995).

The surface marking of the artery is along a line, slightly convex laterally, from medial to the biceps tendon in the cubital fossa to a point medial to the styloid process of the radius. It can be surgically exposed or cannulated at its lower end **(**Sinnatamby, 1999).

## *Branches of the Radial artery*

The branches of the radial artery may be divided into three groups, corresponding with the three regions in which the vessel is situated.

**In the forearm:** radial recurrent artery, muscular branches, palmar carpal artery and superficial palmar artery.

**At the wrist:** dorsal carpal and first dorsal metacarpal.

**In the hand:** princeps pollicis artery, radialis indicis artery, palmar interosseous arteries, perforating and recurrent branches. (Gray H, 1995)

The radial reccurent artery originates from the main trunk of the radial artery approximately 1 cm distal to the radial edge of the bicipital aponeurosis. Immediately after the takeoff, the radial reccurent artery turns proximally and then divides into a leash of vessels that travel dorsally to supply the extensor muscle compartment of the forearm.

The second major arterial branch, the superficial palmar artery, which arises from the main trunk of the radial artery to course into the palm to supply the muscles of the thenar eminence. The superficial palmar artery continues on in the palm to provide the major contribution to the superficial palmar arch of the hand **(**Little, 1973).

In addition the radial artery gives off many small perforating branches that form a vascular network that supplies the forearm and hand. These small branches exit the main trunk of the radial artery at irregular points throughout its entire course in the volar forearm. Most of these branches come off the dorsal aspect of the radial artery. In the proximal half of the radial artery course in the forearm, the segment covered by the brachioradialis muscle, there are an average of4.2 branches (range, 0-10) branches. In the distal half of the radial artery course, the portion that lies directly under the skin and fascia, the great majority of these small branches (9.6 branches on average with a range, 4-14) exit the main trunk of the vessel. The perforating branches in the proximal half of the radial artery course in the volar forearm tend to be longer and more prominent than those in the distal zone. **(Strauch**, 1993).