

# **Anesthetic Management of Cardiac Patient with Stent Undergoing Non-Cardiac Surgery**

**Essay**

Submitted for Partial Fulfillment of Master Degree in  
Anesthesiology

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2010

**بسم الله الرحمن الرحيم**

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**صدق الله العظيم**

(سورة العلق - من الآية ١ : ٥)

## **Abstract**

In the last 20 yr, there have been important developments in the field of PCI, initially with balloon angioplasty alone & now in combination with coronary stent insertion. In patients scheduled for non-cardiac surgery the risk of MI is increased in the perioperative period so the heart should be protected either by drugs or by preoperative cardiac intervention. Coronary artery stents are two types; Bare Metal stents and Drug Eluting stents. Both types of coronary stents require administration of antiplatelet drugs. The management of these type of patients is an dilemma. This comes from the use of antiplatelet therapy that affects the function of the platelets.

**Key Words:** PCI : Percutaneous coronary intervention

MI : Myocardial Infarction.

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## Acknowledgement

First of all, all gratitude is due to ALLAH almighty for blessing this work, until it has reached its end, a s part of his generous help, throughout my life.

Really I can hardly find the words to express my gratitude to Prof. Dr. **AMR ZAKY MANSOUR** Professor of Anesthesia and Intensive Care, Faculty of Medicine, Cairo University, for his supervision, continuous help, encouragement throughout this work and tremendous effort he has done in the meticulous revision of the whole work. It is a great honor to work under his guidance and supervision.

I am also indebted to Prof. Dr. **AHMED EHSSAN EL AGATY** Professor of Anesthesia and Intensive Care, Faculty of Medicine, Cairo University, for his guidance, continuous assistance and sincere supervision of this work.

I would like also to express my sincere appreciation and gratitude to Dr. **Sameh Nabeel Abo Allam** Lecturer of Anesthesia and Intensive Care, Faculty of Medicine, Cairo University, for his continuous directions and support throughout the whole work.

Last but not least, I dedicate this work to my family, whom without their sincere emotional support, pushing me forward this work would not have ever been completed.

## List of Abbreviations

|                  |                                                                                  |
|------------------|----------------------------------------------------------------------------------|
| <b>ACC</b>       | American College of Cardiology                                                   |
| <b>ACS</b>       | American College of Surgeons                                                     |
| <b>ACS</b>       | Acute coronary syndrome                                                          |
| <b>ADA</b>       | American Dental Association                                                      |
| <b>ADP</b>       | Adenosine di phosphate                                                           |
| <b>AHA</b>       | American Heart Association                                                       |
| <b>AMP</b>       | Adenosine mono phosphate                                                         |
| <b>ASRA</b>      | American Society of Regional Anesthesia                                          |
| <b>BENESTENT</b> | Belgium Netherlands Stent                                                        |
| <b>BMS</b>       | Bare metal stent                                                                 |
| <b>CABG</b>      | Coronary artery bypass graft                                                     |
| <b>CAD</b>       | Coronary artery disease                                                          |
| <b>CARP</b>      | Coronary Artery Revascularization Prophylaxis                                    |
| <b>COX</b>       | Cyclooxygenase                                                                   |
| <b>CURE</b>      | Clopidogrel in Unstable Angina to Prevent Recurrent Ischemic Events              |
| <b>DECREASE</b>  | Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress Echocardiography |
| <b>DES</b>       | Drug eluting stent                                                               |
| <b>GMP</b>       | Guanisine mono phosphate                                                         |
| <b>LMWH</b>      | Low molecular weight heparin                                                     |
| <b>MA</b>        | Maximum amplitude                                                                |
| <b>MACE</b>      | Major adverse cardiac events                                                     |
| <b>mTOR</b>      | Mammalian target of rapamycin                                                    |
| <b>NICE</b>      | National Institute for Health & Clinical Excellence                              |
| <b>NSAID</b>     | Nonsteroidal anti-inflammatory drug                                              |
| <b>PCI</b>       | Percutaneous coronary intervention                                               |
| <b>PFA</b>       | Platelet function analyser                                                       |
| <b>PG</b>        | Prostaglandins                                                                   |
| <b>PREMIER</b>   | Prospective Registry Evaluating Myocardial Infarction: Events and Recovery       |
| <b>PTCA</b>      | Percutaneous transluminal coronary angioplasty                                   |
| <b>PWA</b>       | Platelet work analyzer                                                           |
| <b>SCAI</b>      | Society for Cardiovascular Angiography and Intervention                          |
| <b>SIGN</b>      | The Scottish Intercollegiate Guidelines Network                                  |

|               |                                            |
|---------------|--------------------------------------------|
| <b>STEMI</b>  | ST segment elevation myocardial infarction |
| <b>STRESS</b> | Stent Restenosis Study                     |
| <b>TX</b>     | Thromboxane                                |
| <b>UFH</b>    | Unfractionated heparin                     |
| <b>VEGF</b>   | Vascular endothelial growth factor         |

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# Introduction

### **Introduction**

In the last 20 years, there have been important developments in the field of percutaneous coronary intervention (PCI), initially with balloon angioplasty alone and now in combination with coronary stent insertion **(1)**.

The technique was initially described in 1977 and involves advancement of a balloon-tipped catheter into an area of coronary narrowing, inflation of the balloon, and then subsequent removal of the catheter after balloon deflation **(2)**.

Widespread use of balloon angioplasty was initially limited by two major complications: acute vessel closure during or immediately after the procedure secondary to thrombosis or vessel dissection and restenosis of the vessel due to a combination of elastic recoil, smooth muscle proliferation, and neointimal hyperplasia. Both of these complications were considerably reduced by the introduction of coronary stents which are deployed over a balloon at the site of an atheromatous lesion **(1)**.

Puel and Sigwart, in 1986, deployed the first coronary stent to act as a scaffold, thus 1) preventing vessel closure during PTCA, and 2) reducing the incidence of angiographic restenosis, which had an

## **Introduction**

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occurrence rate of 30-40 %**(3)**. This increased safety and efficacy of PCI has led to an exponential rise in the number of procedures being performed, with currently more than 90% of all PCIs involving the placement of at least one coronary stent **(4)**.

By 1999, stenting composed 84.2% of all PCIs **(3)**. Nowadays, PCI with stenting is used as a routine treatment of coronary artery disease**(5)**.

Consequently, an increasing sub-group of the population with coronary artery disease (CAD) has a coronary stent implanted and may subsequently require non-cardiac surgery **(4)**. Stent design and materials, implantation techniques and periprocedural antiplatelet drug regimens are persistently evolving. **(5)**

There was a lag of 13 yr after the initial publication of Sigwart and colleagues, until the first reports appeared suggesting that PCI may have disadvantages in patients later undergoing non-cardiac surgery **(6)**.

Kaluza and colleagues drew attention to the problem by reporting an alarming 20% perioperative mortality rate in patients undergoing surgical procedures after PCI with stenting **(7)**. Furthermore, perioperative alteration of the concomitant, mandatory antiplatelet therapy appeared to be of crucial importance to Kaluza and colleagues**(5)**.

# Arterial Supply of the Heart

### **Arterial Supply of the Heart :**

The arterial supply of the heart is provided by the right and left coronary arteries, which arise from the ascending aorta immediately above the aortic valve (Fig. 1) . The coronary arteries and their major branches are distributed over the surface of the heart, lying within subepicardial connective tissue **(8)**.

The right coronary artery arises from the anterior aortic sinus of the ascending aorta and runs forward between the pulmonary trunk and the right auricle . It descends almost vertically in the right atrioventricular groove, and at the inferior border of the heart it continues posteriorly along the atrioventricular groove to anastomose with the left coronary artery in the posterior interventricular groove. The following branches from the right coronary artery supply the right atrium and right ventricle and parts of the left atrium and left ventricle and the atrioventricular septum **(8)**.

### **Branches:**

- The right conus artery supplies the anterior surface of the pulmonary conus (infundibulum of the right ventricle) and the upper part of the anterior wall of the right ventricle.
- The anterior ventricular branches are two or three in number and supply the anterior surface of the right ventricle. The marginal

## ***Arterial Supply of the Heart***

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branch is the largest and runs along the lower margin of the costal surface to reach the apex.

- The posterior ventricular branches are usually two in number and supply the diaphragmatic surface of the right ventricle.
- The posterior interventricular (descending) artery runs toward the apex in the posterior interventricular groove. It gives off branches to the right and left ventricles, including its inferior wall. It supplies branches to the posterior part of the ventricular septum but not to the apical part, which receives its supply from the anterior interventricular branch of the left coronary artery. A large septal branch supplies the atrioventricular node. In 10% of individuals the posterior interventricular artery is replaced by a branch from the left coronary artery.
- The atrial branches supply the anterior and lateral surfaces of the right atrium. One branch supplies the posterior surface of both the right and left atria. The artery of the sinuatrial node supplies the node and the right and left atria; in 35% of individuals it arises from the left coronary artery.

The left coronary artery, which is usually larger than the right coronary artery, supplies the major part of the heart, including the greater part of the left atrium, left ventricle, and ventricular septum. It arises from the left posterior aortic sinus of the ascending aorta and passes forward between the pulmonary trunk and the left auricle . It then enters the atrioventricular groove and divides into an anterior interventricular branch and a circumflex branch(8) .