

ANALYSIS OF EXERCISE TECHNIQUES IN CORONARY ARTERY BYPASS GRAFT SURGERY: A NARRATIVE REVIEW OF THE LITERATURE

Pedro Fernandes Castro Leão Ferreira
<https://orcid.org/0009-0001-8570-1505>

Katheleen Victoria Carvalho Pinto
<https://lattes.cnpq.br/9255734158888579>

Fernanda Ferreira Gouveia
<https://lattes.cnpq.br/2875545470504486>

Laura Cristina Alves de Sousa
<https://lattes.cnpq.br/5732828604961650>

Beatriz Simões Tiago
<https://lattes.cnpq.br/8435762331833174>

Guilherme Henrique de Araujo Ferreira
<https://lattes.cnpq.br/5864045884291682>

Clovis de Medeiros Bezerra
<https://lattes.cnpq.br/4188360050180967>

Larissa Maria Salvi
<https://lattes.cnpq.br/3381151979795275>

Vanessa Maria Gonçalves de Souza
<https://lattes.cnpq.br/0946058116846305>

Bianca Yumi Takano
<https://lattes.cnpq.br/418956119270165489>

Gabriella Rodrigues Araujo
<https://orcid.org/0000-0003-0137-3573>

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Abstract: Objective: To analyze exercise techniques in coronary artery bypass grafting. Literature Review: Myocardial revascularization is a procedure performed in cases of coronary artery obstruction and aims to unblock and restore blood flow to these vessels. The main risk factors for coronary disease are systemic arterial hypertension, diabetes mellitus, dyslipidemia, age, gender, heredity, overweight and obesity, sedentary lifestyle, and smoking. Several minimally invasive myocardial revascularization techniques have been facilitated by adequate endoscopic vision during dissection of the internal thoracic artery. The use of these techniques in cardiovascular surgery has provided a new, less invasive alternative for individuals with coronary insufficiency. The operation can be performed with better aesthetics, allowing for faster recovery and shorter hospital stay. Final considerations: In short, what is considered ideal in myocardial revascularization surgery is that it is performed at low cost and in a minimally invasive manner (video-assisted or robotic), without the use of extracorporeal circulation, using arterial grafts and, if necessary, associated with hybrid procedures (minimally invasive surgery complemented by percutaneous intervention).

Keywords: Cardiovascular surgery, myocardium, revascularization, arteries.

INTRODUCTION

The main therapeutic measures for cardiovascular diseases are pharmacological, physical activity, nutritional and cardiac surgery. Among cardiac surgical procedures, myocardial revascularization stands out, which is characterized as a procedure performed in cases of obstruction of the coronary arteries and aims to unblock and restore blood flow to these vessels.

The main risk factors for coronary diseases are systemic arterial hypertension, diabetes mellitus, dyslipidemia, age, gender, heredity, overweight and obesity, sedentary lifestyle and smoking. These risk factors present in the same patient increase the chances of cardiac complications, such as ischemia, thus requiring myocardial revascularization surgery.

However, myocardial revascularization can interfere in several aspects of an individual's life, with possible implications for their quality of life.

Despite advances in clinical therapy and percutaneous interventions, myocardial revascularization surgery is still widely used in the treatment of patients with coronary insufficiency. Of the various cardiac surgeries performed by the Unified Health System (SUS), the most frequent is myocardial revascularization surgery (CABG), performed by more than a hundred teams, both in public and philanthropic or private hospitals.

BIBLIOGRAPHIC REVIEW

MINIMALLY INVASIVE TECHNIQUES

OFF-PUMP REVASCULARIZATION

The search for less invasive procedures led to the development of off-pump revascularization techniques. Initially reserved for the treatment of single coronary lesions located in the anterior wall of the heart, this tactic was quickly extended to patients with lesions in two or more vessels. Different models of cardiac stabilizers were developed, which allowed for regional reduction of cardiac movement. Intracoronary shunts were also used, which allowed for maintenance of irrigation of the distal bed during the anastomosis, avoiding ischemia and possible hemodynamic deterioration. This provided greater comfort for the creation of anastomoses in these

surgeries. The great benefit of the method is that it avoids excessive manipulation of the ascending aorta. Thus, although it is desirable to minimize the use of extracorporeal circulation in myocardial revascularization, it is still a major challenge for modern cardiac surgery to avoid it in all cases.

MYOCARDIAL REVASCULARIZATION BY MINI-ACCESS

In an attempt to maintain the benefits of surgical treatment of coronary insufficiency, with less invasive techniques and less surgical trauma, attempts have been made to perform myocardial revascularization with the internal thoracic artery by mini-thoracotomy, avoiding extracorporeal circulation and sternotomy.

One of the main concerns of this new technique was the quality of the anastomosis of the internal thoracic artery with the coronary artery, in the absence of extracorporeal circulation and by mini-access. With the advent of regional coronary stabilizers, coronary anastomosis with a beating heart began to be performed more safely and myocardial revascularization without extracorporeal circulation with total sternotomy or by mini-access began to be more widely accepted by cardiovascular surgeons.

ROBOTIC SURGERY IN MYOCARDIAL REVASCULARIZATION

Several minimally invasive techniques for myocardial revascularization have been facilitated by adequate endoscopic vision during dissection of the internal thoracic artery. The use of these techniques in cardiovascular surgery has provided a new, less invasive alternative for individuals with coronary insufficiency. The operation can be performed with better aesthetics, enabling a faster recovery and shorter hospital stay.

In Brazil, robotic dissection of the left internal thoracic artery began in 2001, using video-assisted thoracoscopy guided by a robotic arm (AESOP), integrated with the fiber optic movement system, through voice communication. It is important to remember that the improvement and application of these techniques require training in stages and an intensive learning curve.

Several recent studies have demonstrated the advantages of these minimally invasive procedures. The ultimate goal would be to make complete myocardial revascularization feasible with the help of video-assisted thoracoscopy, without opening the chest.

In this sense, robotic assistance has been gradually gaining ground in clinical practice, assisting in the dissection of the internal thoracic artery and in performing coronary anastomosis. Robotic myocardial revascularization surgeries with the chest completely closed are a reality in some centers in the United States and Europe, with anastomoses performed using mechanical devices, without the use of extracorporeal circulation. Despite initial reports of favorable results, the high cost of this equipment and the great difficulty in the learning curve have limited these procedures to a few specialized centers in the world.

All of these innovations aim to optimize the results already achieved, with less aggression to the patient and with lower morbidity and mortality; some, however, still need to be routinely incorporated into daily

clinical practice, making the procedures more effective, safe and reproducible.

FINAL CONSIDERATIONS

Even today, myocardial revascularization surgery remains an excellent therapeutic option for treating obstructive coronary artery disease, even in diabetic patients, elderly patients and patients with low left ventricular ejection fraction. Alternative procedures, such as the use of laser beams, stem cells and even variations in the use of the internal thoracic artery have been described, but they are part of the treatment of a special group of patients, who certainly do not fit into the daily routine.

The objectives of this surgery are basically to relieve angina symptoms, with a consequent improvement in quality of life, as well as increased survival. The aim, especially in young patients, is to find an alternative type of intervention to drug or percutaneous treatment that maintains long-term results, preventing the recurrence of angina or cardiac events, thus minimizing the need for reoperations or reinterventions.

In short, what is considered ideal in myocardial revascularization surgery is that it is performed at low cost and in a minimally invasive manner (video-assisted or robotic), without the use of extracorporeal circulation, using arterial grafts and, if necessary, associated with hybrid procedures (minimally invasive surgery complemented by percutaneous intervention).

REFERENCES

Stolf NAG, Braile DM. Euryclides de Jesus Zerbini: uma biografia. *Rev Bras Cir Cardiovasc.* 2012; 27(1):137-47.

Lytle BW, Blackstone EH, Sabik JF, Houghtaling P, Loop FD, Cosgrove DM. The effect of bilateral internal thoracic artery grafting on survival during 20 postoperative years. *Ann Thorac Surg.* 2004;78(6):2005-12.

Deinger MO. Análise comparativa da perviedade das artérias torácicas internas direita e esquerda na revascularização da região anterior do coração. Avaliação por angiotomografia no 6º mês de pós-operatório [Tese de doutorado]. São Paulo: Faculdade de Medicina da Universidade de São Paulo; 2012

Mesquita AT, Ribeiro AQ, Araujo MP, Campos LAM, Fernandes MA, Colafranceschi AS, et al. Indicadores de qualidade assistencial na cirurgia de revascularização miocárdica isolada em centro cardiológico terciário. *Arq Bras Cardiol.* 2008; 90 (5): 350-4.

GODINHO, Ana Sofia et al. Cirurgia de revascularização miocárdica com circulação extracorpórea versus sem circulação extracorpórea: uma metanálise. *Arquivos Brasileiros de Cardiologia*, v. 98, p. 87-94, 2012.

PIEGAS, Leopoldo S.; BITTAR, Olímpio J. Nogueira V.; HADDAD, Nagib. Cirurgia de revascularização miocárdica: resultados do Sistema Único de Saúde. *Arquivos Brasileiros de Cardiologia*, v. 93, p. 555-560, 2009.

MARQUES, Ana Maria Rocha; D'ALESSANDRO, Walmirton Bezerra; D'ALESSANDRO, Aline Almeida Barbaresco. Estudo de revisão: A eficácia dos protocolos de fisioterapia na prevenção das disfunções pulmonares no pós-operatório da revascularização miocárdica. *AMAZÔNIA: SCIENCE & HEALTH*, v. 5, n. 1, p. 48-52, 2017.

CALLEGARO, Giovana Dorneles et al. Significando o processo de viver a cirurgia de revascularização miocárdica: mudanças no estilo de vida. *Revista Gaúcha de Enfermagem*, v. 33, p. 149-156, 2012.

SOUZA, Andressa Rodrigues de et al. Fatores associados a um impacto na qualidade de vida pós-revascularização miocárdica. 2018.

DALLAN, Luís Alberto Oliveira; JATENE, Fabio Biscegli. Revascularização miocárdica no século XXI. *Brazilian Journal of Cardiovascular Surgery*, v. 28, p. 137-144, 2013.

CARVALHO, Márcio Roberto Moraes de et al. Aplicação do EuroSCORE na cirurgia de revascularização miocárdica em hospitais públicos do Rio de Janeiro. *Brazilian Journal of Cardiovascular Surgery*, v. 25, p. 209-217, 2010.

LEDUR, Priscila et al. Preditores de infecção no pós-operatório de cirurgia de revascularização miocárdica. *Brazilian Journal of Cardiovascular Surgery*, v. 26, p. 190-196, 2011.