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Left internal thoracic artery and saphenous vein as a composite graft: 8-year angiographic follow-up study

Enxerto composto de artéria torácica interna esquerda e veia safena magna: estudo angiográfico após oito anos

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Abstract

The use of a composite graft of left internal thoracic artery (LITA) with arterial or saphenous vein (SV) segments can allow complete revascularization of the left coronary system (LCS) without cardiopulmonary bypass (CPB) and without ascending aorta manipulation (AAM), in order to reduce some complications in the immediate postoperative period. This study shows 8-year angiographic follow-up results of two patients underwent no-touch aorta off-pump coronary artery bypass grafting (CABG) using LITA and SV as a composite graft to supply LCS.

Descriptors: **Myocardial revascularization. Coronary angiography. Saphenous vein. Mammary arteries.**

Resumo

O uso de enxerto composto de artéria torácica interna esquerda (ATIE) com segmentos arteriais ou segmentos de veia safena magna (VSM) pode permitir a revascularização completa do sistema coronariano esquerdo (SCE) sem circulação extracorpórea (CEC) e sem manuseio da aorta ascendente (MAA), como forma de tentar reduzir alguns riscos e complicações no pós-operatório imediato. Neste trabalho, relatamos os resultados angiográficos, após oito anos, de dois pacientes submetidos à cirurgia de revascularização do SCE com enxerto composto de ATIE e VSM, sem CEC e sem MAA.

Descritores: **Revascularização miocárdica. Angiografia coronária. Artéria torácica interna. Veia safena.**

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INTRODUCTION

The use of composite graft of left internal thoracic artery (LITA) with arterial segments or great saphenous vein (GSV) segments to revascularize both the left and right coronary system (L/RCS) has been widely disseminated by the medical literature. The bases of this technique were introduced by Mills [1] in 1982, aiming at to bypass the high risk of manipulating the atherosclerotic ascending aorta (MAA) during coronary artery bypass graft surgery (CABG) with cardiopulmonary bypass (CPB) support, when one or more of GSV grafts were anastomosed to the LITA, which had previously been anastomosed to the anterior interventricular artery (AIA). These grafts are also known as "Y" or "T" composite grafts.

In the 1990s, followed by the current decade, several authors have published articles in numerous series of patients undergoing CABG with composite grafts, in which the LITA was the only source of blood supply to two or more coronary arteries [2-5]. Over the same period, we also demonstrated in a series of cases that the LITA is capable of providing adequate blood supply for the entire LCS, in times of rest and under stress, without both CPB support and MAA [5,6]. However, there are a few reports in the literature concerning the late angiographic findings in patients with this type of graft configuration. The aim of this study is to report the angiographic results after eight years in two patients undergoing CABG with LITA and GSV composite graft, as well as to analyze some aspects related to their own integrity.

CASE REPORTS

Case 1

Male Patient F.S.D., aged 60 years, diabetic and hypertensive. Eight years ago, he underwent off-pump CABG without MAA. LITA graft was used to revascularize the AIA. A valveless GSV segment from the LITA was used to revascularize the first diagonal artery and the second marginal branch of the circumflex artery (Cx) sequentially.

He was diagnosed with triple-vessel coronary artery disease and collateral coronary circulation of Cx artery to the right coronary artery, as evidenced by coronary angiography. The branches of right coronary artery had diffuse atheromatous arterial disease.

During outpatient clinic follow-up, the patient remained asymptomatic until October 2009, when he developed dyspnea on minimum exertion associated with swelling in his lower limbs; he had been hospitalized with congestive heart failure, caused mainly by the weaning of medical treatment and drug therapy.

Given the time of CRM was performed and for better clinical evaluation, the patient underwent a new cinecoronarioangiography, which showed patency of both grafts, directing attention to the absence of radiological signs indicative of atheromatosis in venous graft in all projections (Figure 1). After conservative treatment, the patient was discharged with a clinical picture of compensated heart failure.

Fig. 1 – A: Right anterior oblique projection. B: left anterior oblique projection

Case 2

Male patient L.A.F., aged 60 years, diabetic and hypertensive. Eight years ago, he underwent off-pump CABG without MAA. LITA graft was used to revascularize the AIA. A valveless GSV segment from the LITA was used to revascularize the first diagonal artery and the second marginal branch of the circumflex artery (Cx) sequentially.

He was diagnosed with severe injuries of the proximal AIA, first diagonal artery, and first marginal branch of Cx artery, all evidenced by cinecoronarioangiography. The right coronary artery had a 100%-lesion in the proximal third, with diffuse disease in its distal branches. He remained asymptomatic until September 2009 when he began to present dyspnea on moderate exertion associated with the weaning of medical treatment and drug therapy. For a better clinical evaluation, a new cinecoronarioangiography was performed, which confirmed patency of both grafts and absence of radiological signs indicative of atheromatosis in venous graft in all projections (Figure 2).

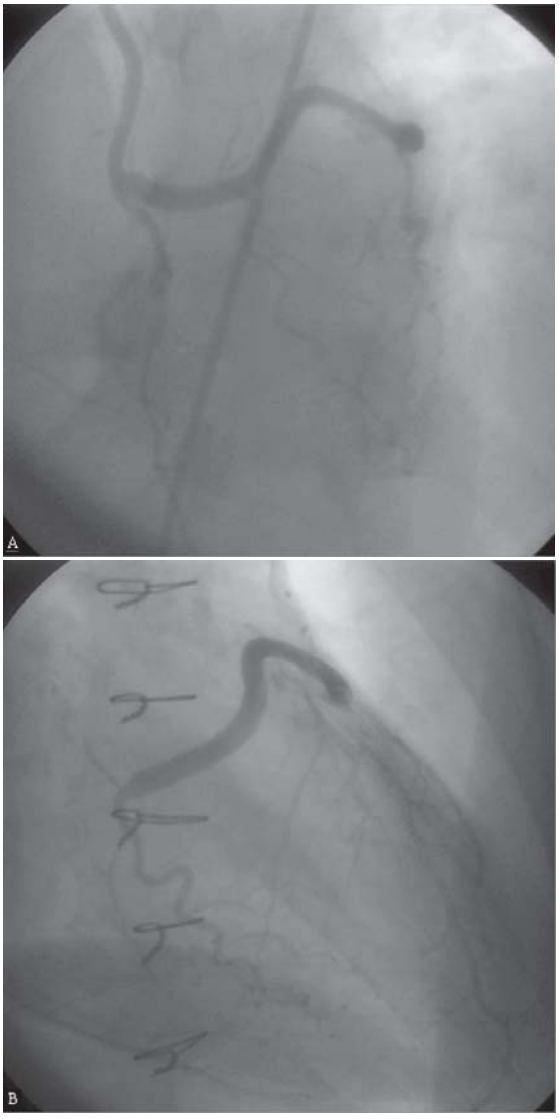

Fig. 2 – A: Left anterior oblique projection. B: right anterior oblique

DISCUSSION

In spite of the forty-two years of continuous progress, CABG still presents complications in the short, medium and long term, which must be minimized. Among the most feared are the neurological complications and obstructions of the coronary grafts.

Regarding neurological complications in the immediate postoperative period, the benefits of using composite grafts in comparison to the conventional technique are well documented in the literature, i.e., the aortocoronary anastomosis, due to minimizing the MAA. Quigley et al. [3] published the results of 290 consecutive patients undergoing off-pump CABG and without MAA, with a 2%-incidence of postoperative stroke.

At our Cardiovascular Surgery Service, we found no neurological complications in the immediate postoperative period of 40 patients over 75 years-old who consecutively underwent off-pump CABG and without MAA using the technique of composite graft [5].

Approximately, 12 years ago, we standardized the use of the Y composite graft to revascularize the LCS, using it as the only source of blood supply to the LITA. From the LITA emerges a valveless GSV segment, which usually revascularizes one or two branches of the referred coronary circulation system; this procedure is performed in 95% of the cases without CPB support and without MAA. Throughout this time, what we have observed is the same shown in the angiographic images of the reports presented here, which are as follows: remodeling of the GSV graft which reaches a similar diameter to the LITA and to that of the revascularized arteries; formation of a collateral circulation from the revascularized artery with the GSV graft, and in most cases, the absence of radiological signs indicative of atheromatous disease in the graft.

Although the use of GSV as an aortocoronary graft is related to a higher incidence of obstructions in the short, medium and long term, it seems likely that the use of GSV segments in combination with LITA may modify these outcomes. Among the main aspects that would favor this new behavior, we highlight:

• The use of small valveless GSV segments, knowingly as adequate sites to the development of atherosclerosis;

• Valveless GSV segments provide, in a condition of flow competition, anterograde and retrograde movement of blood flow, thus preventing its stagnation, responsible in large part by our understanding of early obstruction of the venous grafts;

• Homogeneous tension throughout the composite graft, causing the vessel diameter to suit their flow demands;

• Once the GSV graft comes from the LITA, circulatory stress is possibly smaller than that coming directly from the aorta, thus minimizing the possibility of developing

intimal hyperplasia and, thereafter, atherosclerotic disease;

• It is possible that some of the protective endothelial hormones produced by the LITA can also benefit GSV segments from which they originate [7].

In general, over these past years, progress has occurred in several areas of Medicine. These breakthroughs are influencing and improving the patency of coronary grafts. We put special emphasis on new drugs that help to control dyslipidemias, improve technical manipulation of the grafts, and preoperative evaluations of these grafts, such as the GSV study by Doppler ultrasound [8].

Indeed, we need to analyze a larger number of patients to get more consistent conclusions, rather by randomized studies comparing a group of patients undergoing this type of revascularization to another group undergoing conventional revascularization, i.e., undergoing aortocoronary GSV bypass graft.

However, the patency and the morphological characteristics observed in angiographic examinations of two patients, eight years after surgery, allowed us to consider that the GSV segment used in the described composite graft presented excellent outcomes in a relatively long term, suggesting that this alternative should be considered in the coronary artery bypass graft surgeries.

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