

Left mini-thoracotomy off-pump coronary revascularization

Revascularização miocárdica por minitoracotomia esquerda: série de casos

Theófilo GAUZE¹, Flávio de Almeida ROSA², Waldir Ferreira de SALVI JR³, Elzio TAMAZATO⁴

RBCCV 44205-876

Abstract

Objectives: Stent restenosis is a common complication in angioplasty. Studies have shown better outcomes when the left internal thoracic artery (LITA) is anastomosed to the left anterior descending artery (LAD). Patient selection, operative technique and results for off-pump left mini-thoracotomy (LME) coronary surgery, as a pilot study, are presented.

Methods: Eighteen patients (three women) with a mean age of 56.6 ± 9.2 were operated on through a 9-14 cm LME to perform off-pump LITA to LAD anastomoses (14 patients) or diagonalis (DI) and LAD sequential anastomoses (4 men). The grafts were skeletonized during dissection and anastomoses were performed using 7-0 polypropylene running sutures. An access device (CardioThoracic Systems®) allowed approach and coronary stabilization.

Results: There were no deaths, conversion to sternotomy, transfusions or high enzyme levels. All patients were released

from hospital on the 3rd to 5th postoperative days and returned to their day-to-day activities within 30 days. One woman was readmitted for angina, presented with graft occlusion, and a stent was implanted and one man was readmitted for wound infection. Future angiography was performed on six patients and showed patent grafts.

Conclusion: The operation was performed with low morbidity, short hospital stays and without transfusions. Appropriate instruments and the ability of the surgeon to use his left hand, made this operation technically easy. Randomized studies may prove if there are sufficient clinical and economic benefits over the long term to make this surgery the first choice.

Descriptors: Myocardial revascularization, methods. Surgical procedures, minimally invasive. Mammary arteries. Thorax, surgery.

1. Titled member of SBCCV; Cardiovascular and thoracic surgeon
2. Specialist, Assistant surgeon of the service
3. Specialist SBC / Echocardiographer, Postoperative cardiologist
4. Specialist in cardiology / SBC, Postoperative coordinator

Work carried out in the Dr. Theófilo Gauze Heart-Surgery Clinic - Santa Casa de Campo Grande, MS.

Correspondence address:

Dr.Theófilo Gauze. Rua Maracá, 325 - Vila Rica - Campo Grande - MS - CEP 79022-270 Tel: (67) 3383-6598 / 9981-7816.

E-mail: tgauze@cardiol.br

Artigo recebido em 21 de março de 2006
Artigo aprovado em 8 de fevereiro de 2007

Resumo

Objetivo: A reestenose é uma das complicações frequentes das angioplastias. Estudos demonstraram superioridade da anastomose de Artéria Torácica Interna Esquerda (ATIE) para Coronária Interventricular Anterior (DA). Discute-se a indicação, técnica operatória e resultados da Revascularização do Miocárdio por Minitoracotomia Esquerda (MTE) sem extracorpórea.

Método: Foram operados 18 pacientes (três mulheres), idade de $56,6 \pm 9,2$ anos, com “shunt” intracoronário, para anastomose da ATIE para DA (14 casos) ou Diagonal (DI) e DA (4 homens). Exposição e estabilização foram obtidas com dispositivo Access (CardioThoracicSystems®). O enxerto foi dissecado esquelizado e anastomosado com fio único de polipropileno 7-0.

Resultados: Não ocorreu óbito, conversão para esternotomia, transfusões ou alterações enzimáticas. As altas hospitalares ocorreram entre 3 e 5 dias e todos os pacientes

retomaram suas atividades em até 20 dias. Houve uma reinternação por oclusão do enxerto, tratada com angioplastia, e outra por infecção incisional. Seis pacientes reestudados voluntariamente apresentaram angiografia com enxertos pérvios.

Conclusão: A abordagem mostrou-se segura e sem obstáculos técnicos. Houve tempo de hospitalização curto e baixa morbidade, sem uso de hemoderivados. O instrumental apropriado e, casualmente, a aptidão manual esquerda do cirurgião facilitaram a técnica. Estudos randomizados poderão demonstrar se há benefício econômico e/ou clínico, no longo prazo, desta abordagem como tratamento preferencial.

Descritores: Revascularização miocárdica, métodos. Procedimentos cirúrgicos minimamente invasivos. Artéria torácica interna. Tórax, cirurgia.

INTRODUCTION

The phenomenon of re-stenosis is a frequent and undesirable problem after arterial dilation by balloon catheter followed by stent deployment [1]. With the advent of drug-eluting stents the result of these procedures improved, however, intra-prosthesis restenosis persisted at an even higher rate [2-4]. Long-term studies demonstrated that coronary artery bypass grafting (CABG) using the left internal thoracic artery (LITA) to the anterior interventricular coronary artery (AD) reduced the symptoms with a lower incidence of re-interventions and better preservation of the left ventricular ejection fraction, compared to clinical treatment using medications and also to angioplasty [5].

The appearance of innovative stabilizing devices and intracoronary shunts, as well as the development of retractors and surgical techniques such as minimally invasive access, has rekindled interest in the comparative reassessment of the true costs and benefits of available approaches for revascularization, now in respect to the long-term evolution.

In 2001, after preparation and training, we started to perform off-pump CABG surgery using various epicardial stabilizers. At this time, we also utilized intracoronary perfusion devices as a method of ischemic myocardial protection during distal anastomoses. Progressively, we increased the percentage of patients and today approximately 80% of CABG surgeries use this technique. With experience, we started to develop a pilot study of CABG using minimally invasive access by left anterior thoracotomy (LAT), approaching the anterior branches of the left coronary artery without cardiopulmonary bypass for the

treatment of obstructions of the anterior descending and diagonal coronary arteries [6-8].

METHOD

In the period from January 2004 and February 2006, 18 patients with coronary artery insufficiency were submitted to CABG employing LAT. The project was authorized by the institution's Ethics Committee and all the patients gave their written consent before the surgery. The mean age of the patients was 56.6 ± 9.2 years involving 3 (16.5%) women and 15 (72.2%) men. All the patients were symptomatic and presented with positive stress test results in the preoperative evaluation. The left ventricle ejection fraction (Teicholtz) varied from 34 to 68% ($51.2 \pm 8.5\%$). Comorbidities included previous myocardial infarction and angioplasties in 4 (22.2%) cases, chronic obstructive pulmonary disease in 6 (33.3%), significant peripheral vascular disease in 2 (11.1%) and significant involvement of the diagonal branch in 4 (22.2%). LAT was used as the access method with incisions that ranged from 9 to 14 cm in length. An access device (CardioThoracicSystems® - Figure 1) was employed to expose the LITA and for its dissection using skeletonization with its branches ligated using titanium clips (Johnson LT200®) in the proximal portion and cauterized using an electric scalpel in the distal portion. After preparing the graft and opening the pericardium, an adequate length was assessed. Heparinization was achieved with a single dose of 1.5 mg/kg weight and simultaneously a sublingual dose of 200mg acetylsalicylic acid was administered to these patients. With the retractor and its stabilizing system duly

installed over the AD coronary artery, coronary arteriotomy was initiated without tying the artery. Hemostasis in this phase was simply by proximal compression on the artery by the assistant surgeon, posterior to the anatomic clamping. An intracoronary perfusion shunt was established (Figure 2) and the direct anastomosis of the LITA to the AD was performed using a continuous 7-0 polypropylene suture (Figure 3). Ischemia of more than 30 seconds was not seen in any of the cases before the installation of the shunt and reperfusion. After reversing the effects of heparin with protamine, a 28mm thoracic drain was installed and connected to a closed water-sealed drainage system.

RESULTS

The procedures of all 18 patients were successful, with four receiving sequential anastomoses for the DI-AD coronary arteries (1.2 grafts/patient). There were no deaths,

transfusions or enzymatic or electrocardiographic alterations. Conversion to sternotomy was not necessary in any of the cases. The period in the cardiology intensive care unit ranged from 18 to 36 hours (24.3 ± 8.5 hours). The postoperative clinical evolution was adequate and all patients were released from hospital on the third or fourth postoperative day (median 3.5 days). The patients returned to their normal activities within 20 days. The esthetic result was, in general, satisfactory (Figure 4). One patient (female – 34th postoperative day) was readmitted for instable angina and occlusion of the graft at angiography; this patient was treated by angioplasty of the AD coronary artery. One other patient (male – 6th postoperative day) was readmitted for wound infection treated using antibiotics. Six patients volunteered to participate in re-studies and presented with grafts with normal flows (Figure 5). With the exception of the patient with occlusion of the graft, all the others had negative stress test results 60 days after the procedure.



Fig. 1 – Retractor for the dissection of the LITA by minithoracotomy

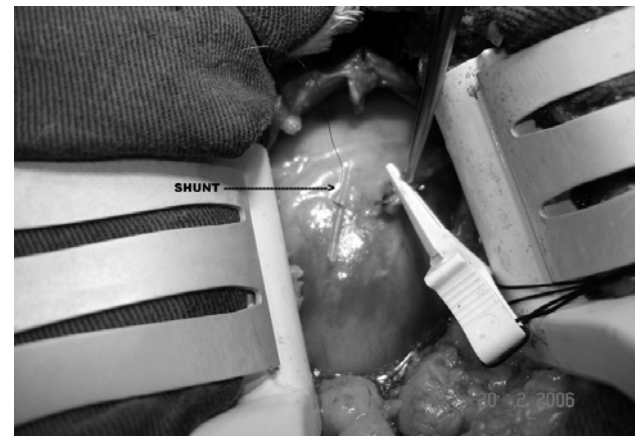


Fig. 2 – Intracoronary perfusor (shunt)



Fig. 3 – Anastomosis using 7-0 thread positioned under the stabilizer



Fig. 4 – Esthetic aspect



Fig. 5 – Late postoperative angiography demonstrating the sequential anastomosis of the LITA to the DI and AD

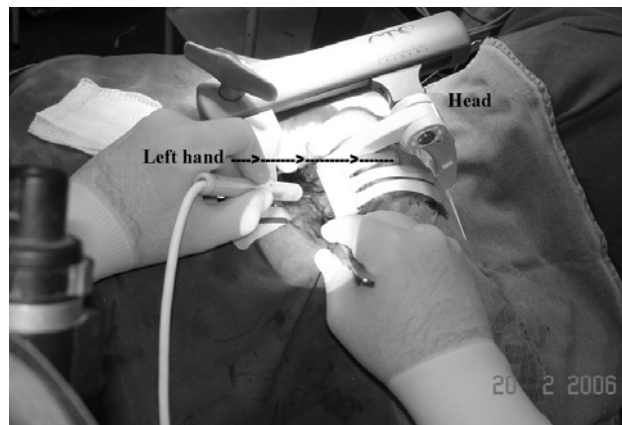


Fig. 6 – The comfortable positioning of the left handed surgeon

and patients submitted to multiple procedures [10] may change the manner in which CABG surgery is indicated with the additional cost of other procedures due to the use of high-cost drug-eluting stents.

CONCLUSIONS

This technique was successfully performed in all patients. The morbid-mortality rate was low and patients appreciated the esthetic appearance of the incision. Further studies may show if and when there are benefits of this operation as the first choice in CABG of the left ventricle anterior wall vessels.

DISCUSSION

The approach proved to be safe and without technical difficulties. The appropriate instruments facilitated the technique, as they enabled adequate exposure of the LITA by raising the costal arches. Selective ventilation was possible in ten patients, in whom no alteration of the capnography occurred and simplified dissection of the LITA. A surprising aspect was the ability of a left handed surgeon (Figure 6) that allowed comfortable positioning of the instruments for dissection of the LITA up to its first intercostal branch. This finding suggests that videothoracoscopy may facilitate this approach greatly. Skeletonization of the graft allowed the greatest length, preventing tension between the anastomoses even when they were performed sequentially. The reduced hospital time and low mortality rate without the use of blood components are certainly interesting objectives in this series.

Increases in high-risk populations such as diabetics [9]

REFERERENCES

1. Gomes WJ, Buffolo E. Stent coronário e inflamação. Rev Bras Cir Cardiovasc. 2003;18(4):III-VII.
2. Farb A, Sangiorgi G, Carter AJ, Walley VM, Edwards WD, Schwartz RS, et al. Pathology of acute and chronic coronary stenting in humans. Circulation. 1999;99(1):44-52.
3. Taniyasu N, Akiyama K, Hirota J, Iba Y. Newly developed left main coronary artery lesion after coronary stenting. J Cardiovasc Surg. 2002;43(1):55-8.

4. Katritsis DG, Karvouni E, Ioannidis JP. Meta-analysis comparing drug-eluting stents with bare metal stents. *Am J Cardiol.* 2005;95(5):640-3.
5. Hueb WA, Bellotti G, Olivera SA, Ariê S, Albuquerque CP, Jatene AD, et al. The Medicine, Angioplasty or Surgery Study (MASS): a prospective, randomized trial of medical therapy, balloon angioplasty or bypass surgery for single proximal left anterior descending artery stenoses. *J Am Coll Cardiol.* 1995;26(7):1600-5.
6. Alessandrini F, Luciani N, Marchetti C, Guadino M, Possati G. Early results with the minimally invasive thoracotomy for myocardial revascularization. *Eur J Cardiothorac Surg.* 1997;11(6):1081-5.
7. Schaff HV. New surgical techniques: implications for the cardiac anesthesiologist: mini-thoracotomy for coronary revascularization without cardiopulmonary bypass. *J Cardiothorac Vasc Anesth.* 1997;11(2 Suppl 1):6-9; discussion 24-5.
8. Biglioli P, Antona C, Alamanni F, Parolari A, Toscano T, Pompilio G, et al. Minimally invasive direct coronary artery bypass grafting: midterm results and quality of life. *Ann Thorac Surg* 2000;70(1):456-60.
9. Influence of diabetes on 5-year mortality and morbidity in a randomized trial comparing CABG and PTCA in patients with multivessel disease: the Bypass Angioplasty Revascularization Investigation (BARI). *Circulation.* 1997;96(6):1761-9.
10. Singh SK, Mishra SK, Kumar D, Yadave RD, Sinha SK. Multivessel total arterial revascularization via left thoracotomy. *Asian Cardiovasc Thorac Ann* 2004;12(1):30-2.