

Minimally-Invasive Coronary Artery Bypass Grafting

Robinson Poffo e Alex Luiz Celullare

Hospital Israelita Albert Einstein, São Paulo, SP - Brazil

Coronary artery bypass grafting (CABG) is the gold standard for the definitive treatment of coronary disease. With the advent of percutaneous transluminal angioplasty, cardiac surgery fell behind, especially for the treatment of one- and two-vessel coronary artery disease, which made surgeons leave their comfort zone and search for new surgical techniques in order to obtain, with smaller incisions, similar results to those of conventional surgery and better postoperative evolution, culminating in the so-called minimally-invasive surgery.

This type of CABG can be found in medical literature as the one that can be performed without cardiopulmonary bypass, but we believe that a better name would be surgery performed through small incisions. Milani et al.¹ describe in their work the evolution of the first one hundred patients undergoing this type of surgery in their group.

The first reports of minimally-invasive CABG date from 1995, when Stanbridge et al.², Robinson et al.³ Benetti and Ballester⁴ and Subramanian et al.⁵ described their techniques and initial results. Within this concept, we have some articles in the national literature demonstrating this technique performed through small incisions, since the articles published by Jatene et al.⁶⁻⁸. Later, Poffo et al.⁹ demonstrated the possibility of performing this surgery associated with other intracardiac diseases with minimum access and videosurgery equipment support.

Although one-vessel CABG through a small incision with or without cardiopulmonary bypass (CPB), has shown to be effective, with a lower rate of blood transfusion, shorter ICU stay, lower complication rate when compared to the conventional surgery¹⁰, it has not been widely used. Among the factors that led to the low adherence to the technique are its greater complexity, restricted operative field, difficulty to perform the complete dissection of the left internal thoracic artery and impossibility to perform proximal anastomoses in the ascending aorta¹¹, whereas, in contrast, interventional cardiology showed a rapid evolution, especially after the introduction of pharmacological stents, which made patients with one-vessel coronary disease be rarely referred for surgery.

During the decades of 1990 and 2000, much has been accomplished in the area of surgical materials to allow smaller-incision surgeries, thus increasing the use of CABG for more

complex cases, with three-vessel lesions. In the study by Milani et al.¹, the authors show a less aggressive alternative to sternotomy for patients undergoing CABG, not only in single-vessel cases, but also in more complex cases with two-vessel disease.

From the time when the technique was perfected, using modifications proposed by McGinn et al.¹², the authors could include technical variants that facilitated the use of lateral minithoracotomy. By using a more lateral access, one can improve the exposure, having access not only to the anterior heart region, but also to the lateral region. With a more lateral access, there is greater arcus costalis mobility, leading to better exposure of the heart and a magnification of the operative field. Another point is the possibility of full access to the internal thoracic artery, which can be dissected from its origin to its bifurcation. It is also possible to perform proximal anastomoses at the aorta.

Even with patient selection in this study, we observed a mean of 1.53 distal anastomoses per patient, and in some cases, it was possible to perform three distal anastomoses. The fact that the surgeries were performed off-pump can be a positive factor in reducing the occurrence of major cardiovascular events¹³, such as mortality and CVA.

From the viewpoint of pulmonary complications, which are considered common and of which rate may be even greater than 87% in conventional myocardial revascularization surgery, according to Ortiz et al.¹⁴, the authors found in their series a relatively low level of complications, of around 11% (adding pneumonia 8% and reintubations 3%) in minimally-invasive surgical procedures, corroborating the findings of the comparative study of Guizilini et al.¹⁵, where the ministernotomy was better concerning lung preservation when compared to total sternotomy.

The most frequent complication in this series of 100 patients was atrial fibrillation (17%), followed by pneumonia (8%) and the risk factors were older age, high EuroSCORE and prolonged duration of mechanical ventilation. Regarding these factors, the authors believe that with greater experience, total surgery time could be significantly reduced, to the point of decreasing the incidence of pulmonary infection.

Another addressed issue was the better patient outcome, with a short hospital stay and early return to normal activities, as it was not necessary to wait 45 days to be able to drive, a fact that occurs after a sternotomy.

The authors have shown an excellent option for the treatment of less complex cases, where the main objective is to provide a safe surgical procedure with lasting results, comparable to those observed with the traditional technique with a low complication rate, and shorter recovery time of these patients.

Keywords

Coronary diseases/surgery; myocardial revascularization; surgical procedures minimally invasive.

Mailing Address: Robinson Poffo •

Avenida Albert Einstein, 627, Morumbi. Postal Code 05652-901,

São Paulo, SP – Brazil

E-mail: drpoffo@einstein.br

Manuscript received August 2, 2012; manuscript revised August 2, 2012;

accepted August 2, 2012.

*Editorial under the responsibility of Cardiosource – Portuguese version.
<http://cientifico.cardiol.br/cardiosource2/default.asp>

References

1. Milani RM, Brofman P, Guimarães M, Olandoski M, Meister Filho H, Baggio T, et al. Minimally-invasive vídeo assisted coronary-artery bypass grafting. *Arq Bras Cardiol.* 2012;99(1):596-604.
2. Stanbridge RL, Symons G V, Banwell P E. Minimal-access surgery for coronary artery revascularization. *Lancet.* 1995;346(8978):837.
3. Robinson MC, Gross DR, Zeman W, Stedje-Larsen E. Minimally invasive coronary artery bypass grafting: a new method using an anterior mediastinotomy. *J Card Surg.* 1995;10(5):529-36.
4. Benetti FJ, Ballester C. Use of thoracoscopy and a minimal thoracotomy, in mammary-coronary bypass to left anterior descending artery, without extracorporeal circulation: experience in 2 cases. *J Cardiovasc Surg.* 1995;36(2): 159-61.
5. Subramanian VA, Sani G, Benetti FJ, Calafiore AM. Minimally invasive coronary bypass surgery; a multi-center report of preliminary clinical experience. *Circulation.* 1995;92(Suppl1):1645.
6. Jatene FB, Pêgo-Fernandes PM, Arbulu HEVD, Hayata ALS, Kalil R, Molnár L, Jatene AD. Cirurgia de revascularização do miocárdio minimamente invasiva com uso de enxerto composto: relato de caso. *Rev Bras Cir Cardiovasc.* 1996;11 (4):307-10.
7. Jatene Fb, Fernandes PM, Stolf NA, Kalil R, Hayata AL, Assad R, et al. Cirurgia de revascularização do miocárdio minimamente invasiva com utilização da videotoroscopia. *Arq Bras Cardiol.* 1997;68(2):107-11.
8. Jatene FB, Pêgo-Fernandes PM, Assad RS, Dallan LA, Hueb W, Arbulu HE, et al. Cirurgia de revascularização do miocárdio minimamente invasiva: resultados com o uso da videotoroscopia e do estabilizador de sutura. *Rev Bras Cir Cardiovasc.* 1998;12(3):233-8.
9. Poffo R, Pope RB, Toschi AP. Correção cirúrgica da comunicação interatrial e revascularização do miocárdio minimamente invasiva videoassistida. *Rev Bras Cir Cardiovasc.* 2009;24(4):586-9.
10. Diegeler A, Walther T, Metz S, Falk V, Krakor R, Autschbach R, Mohr FW. Comparison of MIDCAB versus conventional CABG surgery regarding pain and quality of life. *Heart Surg Forum.* 1999;2(4):290-5.
11. Poffo R. Cirurgia cardíaca minimamente invasiva. *einstein. Educ Contin Saúde.* 2009;7(4 Pt 2):206-10.
12. McGinn JT Jr, Usman S, Lapierre Harry, Pothula VR, Mesana TG, Ruel M. Minimally invasive coronary artery bypass grafting. Dual-Center experience in 450 consecutive patients. *Circulation.* 2009;120(11 Suppl):S78-S84.
13. Godinho AS, Alves AS, Pereira AJ, Pereira TS. Cirurgia de revascularização miocárdica com circulação extracorpórea versus sem circulação extracorpórea: uma metanálise. *Arq Bras Cardiol.* 2012;98(1):87-94.
14. Ortiz LDN, Schaan CW, Leguisamo CP, Tremarin K, Mattos WLLD, Kalil RA, et al. Incidência de complicações pulmonares na cirurgia de revascularização do miocárdio. *Arq Bras Cardiol.* 2010;95(4):441-7.
15. Guizilini S, Bolzan DW, Faresin SM, Alves FA, Gomes WJ. Miniesternotomia na cirurgia de revascularização miocárdica preserva função pulmonar pós-operatória. *Arq Bras Cardiol.* 2010;95(5):587-93.