

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/ihj

Case Report

Total arterial anaortic off-pump coronary artery bypass grafting for diffuse coronary disease – A case report



Kamales Kumar Saha^{*}, Mandar M. Deval, Shekhar Ambardekar, Ajay Kumar, Kakalee K. Saha

Fortis S L Raheja Hospital, Raheja Rugnalaya Marg, Mahim West Mumbai, Maharashtra, India

ARTICLE INFO

Article history:

Received 6 August 2014

Accepted 9 April 2015

Available online 14 May 2015

Keywords:

Off-pump coronary artery bypass grafting

Diffuse coronary artery disease

Anaortic CABG

Arterial graft

ABSTRACT

Surgical treatment of diffuse coronary artery disease remains challenging. We present here a diabetic patient, with diffuse coronary disease, revascularized using total arterial anaortic off-pump coronary artery bypass grafting. He received total nine distal grafts. He continues to be asymptomatic after more than 2 years. CT angiography follow-up shows eight out of nine grafts are patent. Anaortic off-pump coronary artery bypass grafting has the least incidence of stroke and arterial grafts have the best long-term patency rate. This is the first case report of nine arterial bypass graft performed off-pump using both internal mammary and both radial arteries. Anaortic total arterial off-pump coronary artery bypass grafting has achieved excellent intermediate term result in this patient of diffuse coronary artery disease.

Copyright © 2015, Cardiological Society of India. All rights reserved.

1. Introduction

Surgical treatment of diffuse coronary artery disease remains challenging. We are using anaortic total arterial off-pump coronary artery bypass (OPCAB) revascularization to deal with such complex surgical challenges. We report here successful surgical revascularization of a patient with very diffuse coronary artery disease and small distal vessels.

2. Case report

A 56 years old male diabetic, hypertensive patient presented with triple vessel coronary artery disease and normal ventricular function. The coronary angiography revealed diffuse coronary artery disease with small distal vessels (Fig. 1). He underwent elective coronary artery bypass grafting.

^{*} Corresponding author. C-801/802 Raheja Sherwood, Behind Hub Mall, Off Western Express Highway, Nirlon Compound, Goregaon East, Mumbai 400063, India. Tel.: +91 7208045555.

E-mail address: kamalessk@gmail.com (K.K. Saha).

<http://dx.doi.org/10.1016/j.ihj.2015.04.005>

0019-4832/Copyright © 2015, Cardiological Society of India. All rights reserved.

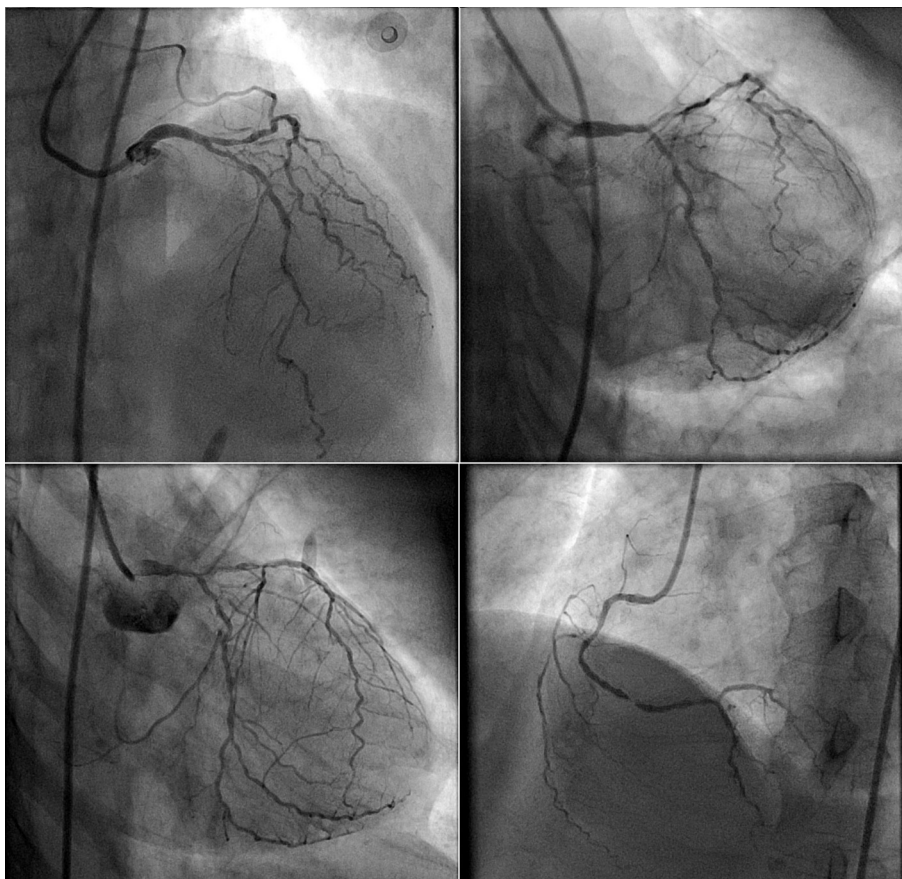


Fig. 1 – Coronary angiography of the patient showing severe coronary artery disease with diffuse distal disease and small distal vessels.

3. Surgical technique

OPCAB surgery was performed through median sternotomy. Both radial arteries and both internal mammary arteries were harvested. We did not use any deep pericardial stay suture. Warm saline soaked gauze pieces were used to position the heart. Suction type of stabilizer and mister blower was used for OPCAB grafting.

LAD (left anterior descending) had diffuse mid segment disease. LIMA (left internal mammary artery) was used for sequential grafting of mid and distal LAD. Right internal mammary artery (RIMA) and right radial artery (RRA) y graft was prepared where end of RRA was anastomosed to the side of RIMA. RIMA was used to graft diagonal artery. Left radial artery (LRA) was anastomosed to the side of the RRA as ‘y’ graft. RRA was used to graft first obtuse marginal (OM1) in proximal segment and second obtuse marginal (OM2) in distal segment. LRA was used to graft third obtuse marginal (OM3), posterior left ventricular branch (PLVB), posterior descending artery (PDA) and acute marginal (AM) artery. PDA had diffuse disease and required endarterectomy. Rest of the operation was completed in usual fashion. Total operating time was 12 h. Patient had uneventful recovery. Postoperative creatinine phosphokinase-MB fraction (CPK-MB) measurement did not reveal any significant rise. He was discharged on 7th postoperative day.

During regular follow-up patient did not complain of any angina. Function of both hands was normal. Postoperative left ventricular function was normal. Postoperative CT angiography after 2 years revealed 8 patent grafts (Fig. 2) with good distal flow including PDA (which had endarterectomy) but ninth bypass graft to acute marginal artery was blocked.

4. Discussion

OPCAB techniques continue to evolve. The advantage of anaortic OPCAB is near zero incidence of stroke.^{1–6} Higher stroke rate is the main drawback of coronary artery bypass grafting (CABG) when compared to percutaneous coronary intervention (PCI) in all recent trials. Moreover, internal mammary artery and radial artery grafts have superior patency rate compared to vein graft.⁷ So anaortic total arterial OPCAB can be considered the best form of surgical revascularization.

OPCAB is often criticized for incomplete revascularization, poor long-term graft patency rate and technical difficulty.⁸ It is often argued still, motionless heart is an essential prerequisite to perform good quality distal anastomosis when distal coronary arteries are small and diffusely diseased. Moreover, sequential internal mammary artery grafting of small diffusely diseased distal coronary using OPCAB is considered

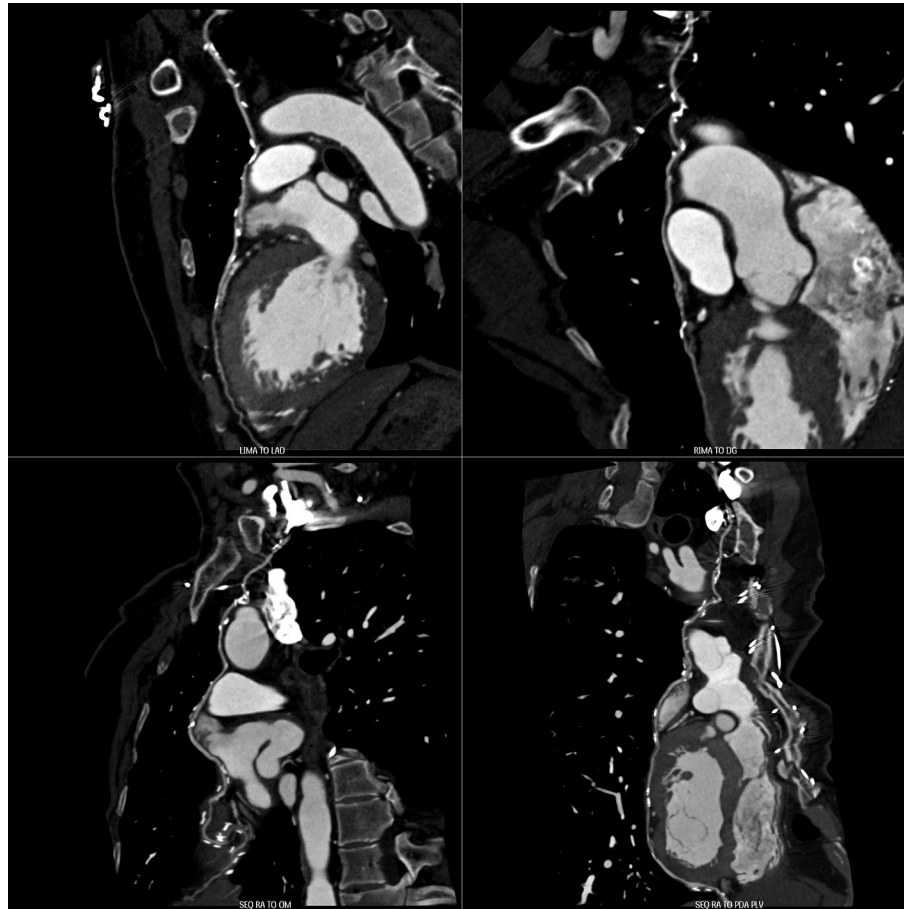


Fig. 2 – CT angiographic follow-up showing 8 patent grafts (clockwise from left upper corner: Sequential LIMA to mLAD and dLAD; RIMA to D; Sequential RRA to OM1 & OM2; Sequential LRA to OM3, PLVB, rPDA).

forbidden.⁹ However, there are evidences in the literature that OPCAB revascularization of small vessels using arterial grafts provides satisfactory patency rate¹⁰ but this is often ignored. We feel with change in mindset, it is possible to overcome these hurdles in OPCAB. This is particularly true in patients with small coronary arteries and diffuse coronary artery disease.¹¹ Safety of sequential and composite grafting is reported in patients with 5 or 6 grafts.¹² It is also established that complete revascularization can be performed using OPCAB.^{13–15}

The patient presented here had diffuse disease with small distal targets. Such patients are considered poor candidate for surgical revascularization due to high incidence of graft failure. This type of small coronary vessel with diffuse CAD is common in this part of the world. Difficult clinical situation demands innovative solutions. Our case presented here proves complete revascularization can be performed during OPCAB with excellent intermediate term result. It is possible to achieve excellent graft patency of sequential internal mammary artery grafting during OPCAB. We feel that in absence of stress of increasing ischemic or bypass time, a perfect anastomosis can be performed even in severely diseased small arteries. For similar reason, performing few

additional grafts was possible without any worry of increasing operating time. It is evident that, performing 9 bypass grafts by conventional CABG using cardiopulmonary bypass will prolong ischemic and cardiopulmonary bypass time. The stress of a longer operation will compel the surgeon to perform fewer grafts and leave few small vessels alone. It can be argued that complete revascularization is easier performed using OPCAB. Our case report proves that with meticulous precise anastomosis technique best result can be achieved by OPCAB also. Modern anesthetic techniques have also become safe for relatively prolonged operations.

After extensive search of literature, we could not find any report of nine bypass grafts done on a patient. It is well known that coronary artery disease in Asian population has a very aggressive pattern affecting younger generation.

Future study of graft patency of in series of patients with diffuse coronary artery disease are required before we could recommend our technique universally.

Conflicts of interest

All authors have none to declare.

REFERENCES

1. Edelman JJ, Yan TD, Padang R, Bannon PG, Valley MP. Off-pump coronary artery bypass surgery versus percutaneous coronary intervention: a meta-analysis of randomized and nonrandomized studies. *Ann Thorac Surg.* 2010;90:1384–1390.
2. Emmert MY, Seifert B, Wilhelm M, Grünenfelder J, Falk V, Salzberg SP. Aortic no-touch technique makes the difference in off-pump coronary artery bypass grafting. *J Thorac Cardiovasc Surg.* 2011;142:1499–1506.
3. Edelman JJ, Yan TD, Bannon PG, Wilson MK, Valley MP. Coronary artery bypass grafting with and without manipulation of the ascending aorta: a meta-analysis. *Heart Lung Circ.* 2011;20:318–324.
4. Saha KK. Bilateral internal mammary arteries: a new trick for coronary artery bypass grafting. *Eur J Cardiothorac Surg.* 2013;43:448.
5. Taggart DP. Bilateral internal mammary arteries: a very important missing trick for coronary artery bypass grafting. *Eur J Cardiothorac Surg.* 2012;41:776–777.
6. Saha KK. Off-pump bilateral internal thoracic artery grafting. *Ann Cardiothorac Surg.* 2014;3:E1. <http://dx.doi.org/10.3978/j.issn.2225-319X.2014.02.09>.
7. Cao C, Ang SC, Wolak K, Peeceeyen S, Bannon P, Yan TD. A meta-analysis of randomized controlled trials on mid-term angiographic outcomes for radial artery versus saphenous vein in coronary artery bypass graft surgery. *Ann Cardiothorac Surg.* 2013;2:401–407. <http://dx.doi.org/10.3978/j.issn.2225-319X.2013.07.03>.
8. Lazar HL. Should off-pump coronary artery bypass grafting be abandoned. *Circulation.* 2013;128:406–413.
9. Lytle BW. Bilateral internal thoracic artery grafting. *Ann Cardiothorac Surg.* 2013;2:485–492. <http://dx.doi.org/10.3978/j.issn.2225-319X.2013.07.04>.
10. Matsuura Kaoru, Kobayashi Junjiro, Tagusari Osamu, et al. 5Rationale for off-pump coronary revascularization to small Branches—Angiographic study of 1,283Anastomoses in 408 patients. *Ann Thorac Surg.* 2004;77:1530–1534.
11. Saha KK. Off-pump coronary artery bypass grafting in India. *Indian Heart J;* 2014. <http://dx.doi.org/10.1016/j.ihj.2014.02.003>.
12. Nakajima Hiroyuki, Kobayashi Junjiro, Toda Koichi, et al. Safety and efficacy of sequential and composite arterial grafting to more than five coronary branches in off-pump coronary revascularization: assessment of intra-operative and angiographic bypass flow. *Eur J Cardiothorac Surg.* 2010;37:94–99.
13. Emmert Maximilian Y, Salzberg Sacha P, Cetina Biefer Hector Rodriguez, et al. Total arterial off-pump surgery provides excellent outcomes and does not compromise complete revascularization. *Eur J Cardiothorac Surg.* 2012;41:e25–e31. <http://dx.doi.org/10.1093/ejcts/ezr225>. Advance Access publication 12 January 2012.
14. Puskas JD, Williams WH, O'Donnell R, et al. Off-pump and on-pump coronary artery bypass grafting are associated with similar graft patency, myocardial ischemia, and freedom from re-intervention: long-term follow-up of a randomized trial. *Ann Thorac Surg.* 2011;9:1836–1843.
15. Saha Kamales Kumar, Kaushal Ram P, Kumar Ajay, Deval Mandar, Saha Kakalee K, Kaul Shibban K. Intraaortic balloon pump boon for off-pump coronary artery bypass grafting. *Asian Cardiovasc Thorac Ann.* 2015;23:267–270. <http://dx.doi.org/10.1177/0218492314544158>. published online 22 July 2014.