



Myocardial revascularization without cardiopulmonary bypass through a ministernotomy

Premostitvena operacija na venčnih arterijah skozi ministernotomijo brez zunajtelesnega krvnega obtoka

Tomislav Klokočovnik

Department of Cardiovascular Surgery, University Medical Centre
Ljubljana

Avtor za dopisovanje (*correspondence to*):

prof. dr. Tomislav Klokocovnik MD, PhD, Department of Cardiovascular Surgery, University Medical Centre Ljubljana, Zaloska 7, 1000 Ljubljana, Slovenia; Tel: + 386 15224941; + 386 41787902; Fax: + 386 15224941; e-mail: tomi.klokocovnik@siol.net

Prispelo/Received: 14.9.2006

Abstract

Background. Although a minimally invasive operative approach has been increasingly used in cardiovascular surgery lately, minimal access off-pump revascularization remains an uncommon procedure.

Patients and methods. At this Department, revascularisation of the left anterior descending artery with the left internal mammary artery (LIMA- LAD) performed via a ministernotomy without cardiopulmonary bypass (CPB), was used in two patients with a total LAD occlusion and good left ventricular function.

Results. A LIMA-LAD anastomosis without CPB performed via a ministernotomy is a safe, yet technically relatively demanding operative technique. Both our patients had an uneventful postoperative course and were discharged from the hospital four and five days after the operation, respectively. No surgery-related complications were observed within 30 days of surgery.

Conclusions. In properly selected patients, a LIMA-LAD off-pump anastomosis performed through a ministernotomy has proved a safe technique with good postoperative results. Its advantages include decreased postoperative pain, faster recovery and shorter hospital stay.

Key words. Off-pump surgery, minimally invasive revascularization.



Izveček

Izhodišča. Čeprav je manj invazivna kirurška tehnika že uveljavljena metoda v kardiovaskularni kirurgiji, je minimalni pristop za premostitvene operacije na venčnih arterijah brez uporabe naprave za zunajtelesni krvni obtok (ZKO) še vedno redko uporabljena metoda.

Bolniki in metode. Minimalno invazivno metodo za premostitev leve venčne arterije z levo prsno arterijo (LIMA-LAD) na delujočem srcu skozi ministernotomijo smo uporabili pri dveh bolnikih. V obeh primerih je bila indikacija za operativni poseg popolna zapora arterije LAD ob dobri funkciji levega prekata.

Rezultati. LIMA-LAD na delujočem srcu skozi ministernotomijo se je izkazala kot varna kirurška metoda, čeprav je za kirurga poseg tehnično nekoliko zahtevnejši. Pri obeh bolnikih je bil pooperativni potek brez zapletov, po četrtem in petem dnevu sta bila odpuščena iz bolnišnice in tudi v 30 dneh po operaciji ni prišlo do zapletov, ki bi bili lahko povezani z operativnim posegom.

Zaključki. LIMA-LAD na delujočem srcu skozi ministernotomijo je možno opraviti varno v izbranih primerih z dobrimi pooperativnimi rezultati.

Ključne besede. Kirurgija brez zunajtelesnega obtoka – t.i. off-pump kirurgija, minimalna invazivna revaskularizacija.

Introduction

Numerous studies have shown that revascularization without cardiopulmonary bypass (CPB) (i.e. off pump) through a median sternotomy is a feasible and safe procedure (1,2).

CPB and median sternotomy have been recognised as major morbidity factors in cardiac surgery (3-5). The conventional median sternotomy, which involves an incision of approximately 30 cm, causes significant trauma and is associated with pain and prolonged postoperative recovery, especially in elderly patients.

An alternative technique is endoscopic harvesting of the mammary artery via a minithoracotomy, and grafting of the left internal mammary artery (LIMA) to the left anterior descending artery (LAD) under direct vision (6). Endoscopic vascular surgery is a technically challenging procedure that requires a special suturing technique and special instruments (7).

We report on two patients operated on by a ministernotomy and off-pump LIMA-LAD anastomosis. There was no need of conversion to CPB or full sternotomy operation. The procedure was accomplished without incidents.

Patients and methods

The procedure was performed in two male patients, aged 64 and 71 years, who presented

with a totally occluded LAD artery and with a mean left ventricular ejection fraction of 65% and 60 %, respectively.

The patients were operated on under general anaesthesia. Self-adhesive external defibrillator pads or paediatric defibrillator pads can be used in case of heart fibrillation.

A straight 6-cm skin incision was made for a left J-shaped partial sternotomy at the level of the 2nd intercostal space (Figs. 1 and 2).

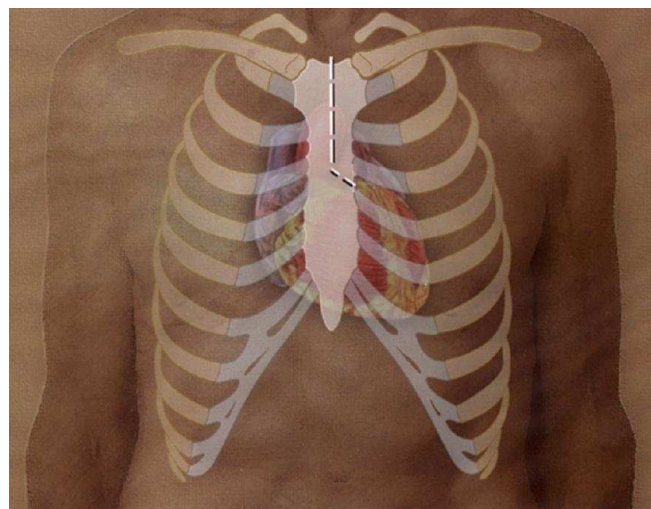


Figure 1

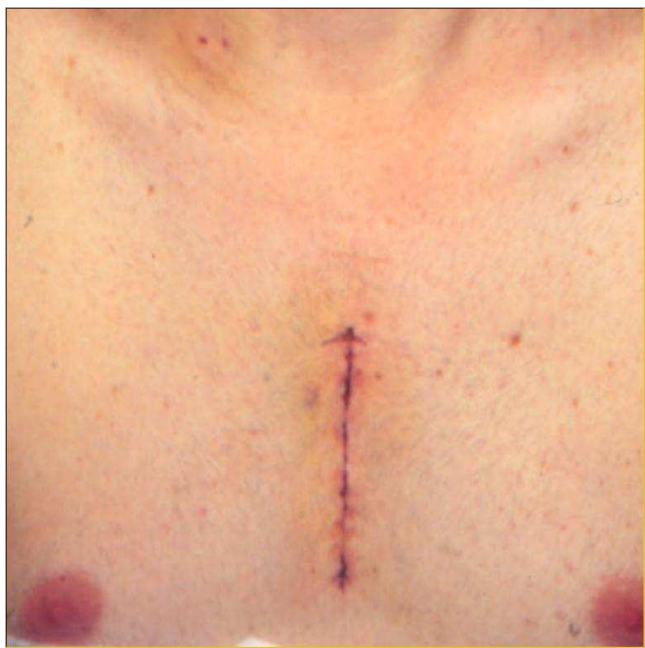


Figure 2

Systemic heparin, 1 – 2 mg/kg body weight, was given to maintain an activated clotting time of more than 250 seconds. LIMA was harvested under direct vision. The partly opened pericardium was then suspended to the skin to help expose the anterior wall of the heart. Under direct vision a LIMA- LAD bypass without CPB was performed with continuous 7-0 prolene suture, using the Medtronic Octopus (Inc) stabilizer.

A right ventricular electrode was applied for temporary electrical stimulation. A drainage tube was inserted into the anterior mediastinum, and haemostasis was achieved. Two steel wires were used for closing the sternotomy. There was no need to convert to CPB or to median sternotomy. The patients were cared for in the intensive care unit for 24 and 18 hours, and were discharged home on the fourth and fifth hospital day, respectively. Neither needed a blood transfusion or showed any complications within 30 days of surgery.

Conclusion

Coronary artery bypass grafting without CPB is a well-established and effective method of myocardial revascularization (1,2).

The use of small upper sternotomy in selected cases may further improve the results of revascularization without CPB by reducing operative trauma. Ministernotomy, which has been used to reduce surgical trauma, provides good exposure of the operating field, similar to that afforded by the conventional procedure. Performing an anastomosis off pump and under direct vision remains a technically easier and more reproducible technique, given the current limitations of endoscopic visualization system (8).

A LIMA-LAD off-pump anastomosis via a mini sternotomy has proved entirely feasible. Further experience is needed with this approach to assess its safety and impact on outcome. When necessary, a ministernotomy can easily be extended to a median sternotomy.

Minimally invasive approaches by a ministernotomy can also be used for aortic or mitral valve replacement, as well as for mitral or tricuspid valve repair, closure of atrial septal defect with sutures, and replacement of the ascending aorta (9).

References

1. Benetti FJ. Direct coronary artery with saphenous vein bypass without either cardiopulmonary bypass or cardiac arrest. *J Cardiovasc Surg* 1985; 26: 217-22.
2. Arom KV, Flavin TF, Emery RW et al. Safety and efficacy of off- pump coronary artery bypass grafting. *Ann Thorac Surg* 2000; 69: 704-10.
3. Diegeler A, Martin M, Falk V et al. Coronary bypass grafting without cardiopulmonary bypass – technical considerations, clinical results and follow- up. *J Thorac Cardiovasc Surg* 1999; 47: 14-8.
4. Ascione R, Angelini GD. Off- pump coronary artery bypass surgery: the implications of the evidence. *J Thorac Cardiovasc Surg* 2003; 125: 779-81.
5. Puskas JD, Williams WH, Duke PG et al. Off pump coronary artery bypass grafting provides complete revascularisation with reduced myocardial injury, transfusion requirements, and length of stay: a prospective randomised comparison of two hundred unselected patients undergoing of two hundred patients off pump versus conventional coronary artery bypass grafting. *J Thorac Cardiovasc Surg* 2003; 125: 797-808.



6. Reichenspurner H, Boehm DH, Gulbins H et al. Robotically assisted endoscopic coronary artery bypass procedures without cardiopulmonary bypass. *J Thorac Cardiovas Surg* 1999; 118: 960-1.
7. Hart JC, Puskas JD, Sabik JF III. Off- pump coronary revascularization: current state of the art. *Semin Thorac Cardiovasc Surg* 2002; 14: 70-81.
8. Liem TH, Williams JP, Hensens AG, Singh SK. Minimally invasive direct coronary artery bypass procedure using a high thoracic epidural plus general anesthetic technique. *J Cardiothorac Vasc Anesth* 1998; 12: 668-72.
9. Cosgrove III DM, Sabik JK, Navia J. Minimally invasive valve surgery. 33 rd Annual Meeting of Society of Thoracic Surgeons. San Diego 1997: 160-1.