Flowmetry During Minimally Invasive Coronary Surgery (MICS)

K. Saatvedt*MD, M. Dragsund MD, K. Nordstrand MD, PhD
Department of Cardiothoracic Surgery
The Feiring Clinic, Norway

During a Minimally Invasive Coronary Surgery procedure the blood volume flow in the left internal mammary artery (LIMA) to the left anterior descending artery (LAD) was measured using a Medi-Stim Flowmeter. The procedure was performed with a limited anterior thoracotomy doing the anastomosis on a beating heart slowed by esmolol.

PATIENT AND DIAGNOSIS
The patient, a 72 years old male, was referred to MICS after arteriographic findings of a 90% stenosis of the LAD. The other coronary arteries were normal as evaluated by angiography. The patient was classified in New York Heart Association class III. The ejection fraction was within normal range. The patient exhibited relative contraindications for extracorporeal circulation.

PROCEDURE
A limited anterior thoracotomy was made over the fourth intercostal space and no resection of the ribs was needed. The pericardium was incised and stay sutures placed. These traction sutures are important both for visualization of the left anterior descending artery and for partly immobilization of the heart. The LAD was inspected and the level of the anastomosis was determined.

The LIMA was harvested under direct vision as far proximal as possible. A long ordinary cautery instrument was used for dissection of the internal mammary artery (IMA, also called the internal thoracic artery, ITA) pedicle. The IMA was treated with intraarterial papaverin. Heparin was administered (5000-10000 IE). Use of the Visuflowâ instrument (Research Medical Inc., Utah, USA) to clear the coronary artery facilitates the anastomy procedure and only one snare suture was placed around the LAD proximal to the incision. No ischemic preconditioning was performed. The heart rate was slowed by administration of esmolol. The anastomosis between IMA and LAD was performed using continuous polypropylene 7.0. The duration of the anastomy procedure was about 6 minutes and the whole operative procedure about 2 hours. The incision was closed leaving a chest tube for 24 hours. The postoperative course was uneventful.

FLOW MEASUREMENT
The IMA volume flow was measured with a 3mm transit time probe connected to a Medi-Stim Flowmeter (Medi-Stim AS, Oslo, Norway).

After immersing the probe head in sterile gel, it was applied on a 15mm free-dissected portion of the IMA/ITA graft giving the flow curve shown in figure 1.
The curve has the characteristic shape of the flow in an internal mammary artery to the LAD with a small back flow during early systole and a main forward flow during diastole. IMA/ITA flow was measured to 52 ml/min falling within the value of 49.8±32.9 ml/min documented by Walpoth et al.\textsuperscript{1}. The good flow value combined with the normal pulsatility index indicates no technical error as described by Louagie\textsuperscript{2}. The accuracy of the CardioMed Flowmeter measuring IMA/ITA flow has earlier been documented by Laustsen et al.\textsuperscript{3}.

**DISCUSSION**

Because of its less invasiveness percutaneous angioplasty has been the procedure of choice for one or two vessel coronary artery disease. Minimally invasive coronary artery bypass surgery, using the internal mammary artery (IMA) to graft either the right coronary artery (RCA) or the LAD, might be an alternative method exhibiting less invasiveness than conventional surgical revascularization. The use of IMA as a graft to the LAD without cardiopulmonary bypass (CPB) was initiated by Kolesov\textsuperscript{4}. Recently a series of reports have been published reporting coronary revascularization without CPB\textsuperscript{5,6,7,8}. The demanding technical nature of performing precise IMA to LAD anastomosis on a beating heart makes intraoperative valuation of the graft volume flow important. The flowmeter used in this brief report is easy to operate and gives you graft flow immediately after myocardial revascularization which enables you to make corrections if the flow is insufficient.

**CONCLUSION**

We feel that MICS is to be considered in every patient with an occluded or stenotic LAD or right coronary artery (RCA). With this technique the surgical invasiveness is minimal and the damaging effects of cardiopulmonary bypass (CPB) is avoided.

References


*Please address all correspondence to: Dr. K. Saatvedt, Dept. of Cardiothoracic Surgery, The Feiring Clinic, N-2093 Feiring, Norway

Correspondence related to the Flowmeter should be forwarded to: Medi-Stim ASA, Marketing Dept., PB 4744 Nydalen, N-0421 Oslo, Norway, or by using e-mail: medistim@medistim.com.