

MYOCARDIAL METABOLISM AND ISCHEMIA ASSESSED BY MICRODIALYSIS

Clinical and experimental studies in cardiac surgery



Akademisk avhandling

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Vittorio Mantovani
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Katholieke Universiteit Leuven, Belgium

Avhandlingen baseras på följande delarbeten:

I. Mantovani V, Kennergren C, Berglin E, Moratti R, Lönnroth P, Hamberger A, Viganò M.
Intramyocardial troponin-T monitoring with microdialysis in coronary artery bypass surgery.
Scand Cardiovasc J. 2002 Sep;36(5):308-12.

II. Kennergren C, Mantovani V, Strindberg L, Berglin E, Hamberger A, Lönnroth P. Myocardial
interstitial glucose and lactate before, during, and after cardioplegic heart arrest.
Am J Physiol Endocrinol Metab. 2003 Apr;284(4):E788-94.

III. Mantovani V, Kennergren C, Goiny M, Ungerstedt U, Lönnroth P, Sala A, Berglin E. Microdialysis
for myocardial metabolic surveillance: developing a clinical technique.
Clin Physiol Funct Imaging. 2006 Jul;26(4):224-31.

IV. Mantovani V, Kennergren C, Bugge M, Sala A, Lönnroth P, Berglin E.
Myocardial metabolism assessed by microdialysis: A prospective randomized comparison in off-pump
and on-pump coronary artery bypass surgery.
Submitted

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Vittorio Mantovani

Institution of Medicine, Department of Metabolic and Cardiovascular Research/
Cardiothoracic Surgery, Sahlgrenska Academy at Göteborg University, Sweden

Abstract

Background: The available methods to study myocardial metabolism and ischemia show considerable limitations when employed during and after cardiac surgery. Microdialysis is a technique for continuous sampling of substances from the interstitium. It has been extensively used in experimental settings in the heart but seldom in clinical studies, due to technical difficulties. The aim of these studies was to test whether microdialysis could be used to study cardiac metabolism and ischemia during and after cardiac surgery.

Method: A microdialysis probe, developed specifically for myocardial implantation in our laboratory, was used in the first two, clinical, studies in order to assess the implantation trauma and to measure the interstitial levels of glucose and lactate during and after cardiac surgery. In a third, experimental, study a commercially available CE-marked probe was adapted for cardiac use. In the fourth, clinical, study this probe was used to assess differences in myocardial metabolism in two randomized groups of patients undergoing coronary artery bypass surgery, with or without cardio-pulmonary bypass, respectively.

Results: In the first study an implantation reaction was indicated by a local release of troponin-T as demonstrated by means of microdialysis. This could be differentiated from the subsequent release of troponin-T due to the surgical trauma. The second study showed that cardioplegic arrest caused a significant decrease of interstitial glucose, but not a total depletion, while lactate accumulated in the interstitium without reaching critically high levels. In the third study, a new implantation method was developed to ensure a quick and easy positioning of the probe in the desired place and to give a stable function. In the fourth study, microdialysis showed that off-pump bypass surgery caused less metabolic derangements compared to on-pump surgery. Microdialysis was also able to correctly detect episodes of cardiac ischemia.

Conclusions: Microdialysis can be used to monitor myocardial metabolism and ischemia without delay and with high precision. The behavior of several interstitial markers during and after cardiac surgery has been described for the first time.

Key words: microdialysis, cardiac metabolism, myocardial ischemia

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