Absolute coronary flow measurement by continuous infusion thermodilution: in-vitro evaluation

Citation for published version (APA):

Document status and date:
Published: 01/01/2006

Document Version:
Publisher’s PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:
• A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher’s website.
• The final author version and the galley proof are versions of the publication after peer review.
• The final published version features the final layout of the paper including the volume, issue and page numbers.

Link to publication

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the “Taverne” license above, please follow below link for the End User Agreement:
www.tue.nl/taverne

Take down policy
If you believe that this document breaches copyright please contact us at:
openaccess@tue.nl
providing details and we will investigate your claim.

Download date: 12. Mar. 2019
Absolute coronary flow measurement by continuous infusion thermodilution: in-vitro evaluation

Maartje Geven¹, Marcel van ’t Veer¹,², Arjen van der Horst¹, Marcel Rutten¹, Wilbert Aarnoudse², Nico Pijls¹,², Frans van de Vosse¹

¹Eindhoven University of Technology, Department of Biomedical Engineering ²Catharina Hospital Eindhoven, Department of Cardiology

Introduction

Direct volumetric coronary blood flow measurement during catheterization has not been possible so far. Derived parameters could be assessed using Doppler probes or thermodilution by bolus injection. In this study, the application of continuous infusion of saline for volumetric flow measurement is assessed.

The method is based on the measurement of the temperatures of the blood and the infused saline, and the mixing temperature distal of the infusion site [1]. The main prerequisite for appropriate calculation of the blood flow is for full mixing of the infusate and the blood to occur.

Materials and methods

The mixing is investigated in a physiologically representative in-vitro model of the coronary circulation (figure 2, [2]), using different over-the-wire infusion catheters (specially designed by Occam, commercially available Boston Scientific Tracker 18), at two infusion rates (15 and 25 ml/min), with coronary flow rates varying between 50 and 250 ml/min.

Results and discussion

The accuracy of the flow derivation increased with increasing infusion rate and decreasing coronary flow. With increasing coronary flow rate, the flow was progressively underestimated, indicating incomplete mixing and concentration of infusate around the wire in the middle of the vessel. The specially designed infusion catheter (Occam) had the best mixing properties: the coronary flow was reliably estimated over the entire range at an infusion rate of 25 ml/min.

Mixing was found to be better when the infusion location was near the entrance of the coronary artery, probably due to the secondary flow patterns. These patterns are expected to be present in the coronary artery as well.

Conclusion

This model study indicates appropriate application of the continuous infusion method for coronary flow measurement, using the specially designed infusion catheter.

References:
