

The Use Of Intraoperative Transit Time Flow Measurement Can Reduce Preoperative Myocardial Injury

Federico Benetti¹

¹Affiliation not available

July 23, 2022

Abstract

In the work by Zheng Quan MD et al. about the Use of Intraoperative Transit Time Flow Measurement Can Reduce Preoperative Myocardial Injury (1), the authors did a retrospective, observational study of the effects of exposure to the TTFM procedure . Fifty-nine people received TTFM, while 47 did not. In total, 7 (6.6%) had at least one grafting vessel obstruction. Only 1 patient where the TTFM was used had an occlusion graft vs. 6 patients where the TTFM was not used and had postoperative injury. In 2001, the use of TTFM techniques for assessing the quality of grafts intraoperatively, on the basis of the presence and volume of flow were clearly described) In conclusion, the work of Zheng Quan MD et al. remarks the importance of the use of TTFM to reduce the incidence of preoperative myocardial injury during off-pump coronary bypass surgery. support of, in some ways, the recent expert opinion to promote the use of TTFM

The Use Of Intraoperative Transit Time Flow Measurement Can Reduce Preoperative Myocardial Injury

Zheng Quan MD,1,3,4 Xiaoyu Zhang MD,2,4, Xueyu Song MD,1,3 Pengyu Chen MD,1,3 Qiyong Wu MD,1,*

Department of Thoracic and Cardiovascular Surgery, Changzhou No. 2 People's Hospital, Affiliated with Nanjing Medical University, Changzhou, Jiangsu, China 2. Heart Center, Northwest Women and Children's Hospital, Xi'an, Shaanxi, China 3. Dalian Medical University, Dalian, Liaoning, China 4. These authors contributed equally to this study *

Correspondence: Qiyong Wu, MD, Department of Thoracic and Cardiovascular Surgery, Changzhou No. 2 People's Hospital, Affiliated with Nanjing Medical University, Changzhou, Jiangsu, China. Email: wqyzycxy@aliyun.com.

In the work by Zheng Quan MD et al. about the Use of Intraoperative Transit Time Flow Measurement Can Reduce Preoperative Myocardial Injury (1), the authors did a retrospective, observational study of the effects of exposure to the TTFM procedure. They collected patient data from the Second People's Hospital of Changzhou, affiliated with Nanjing Medical University, from June 2016 to June 2021; patients undergoing off-pump coronary artery bypass grafting surgical procedures with general anesthesia were eligible. If they met one of the following criteria, patients were excluded: postoperative troponin did not reach normal value; combined with other valve surgery and significant liver dysfunction; died within 1 week after surgery. And after excluding 30 patients who did not meet the criteria, 146 patients were eventually included in the trial. In these studies, postoperative myocardial injury was defined as an independent rise in cardiac troponin (from baseline) 70 times the upper reference limit (URL) according to ARC-2 criteria¹⁰, regardless of the symptoms of ischemia and electrocardiogram changes, within this study, specifically 2380ng/L. All data entered into EpiData Version 2.1 (EpiData Association) was reviewed manually to ensure accuracy. After the coronary vessel bypass is completed, the heart is restored to its anatomic position, attachments are removed, and blood flow is measured immediately using the TTFM. In general, a 3 mm size probe is used for the internal mammary artery and a 4 mm or 5 mm probe for the radial artery or cavernous vein, as

appropriate. The decision to review the graft is based on the TTFM flow, along with the specific clinical situation and an assessment of the target vessel. Blood samples were collected immediately postoperatively, 4 hours postoperatively, 12 hours postoperatively, 24 hours postoperatively, and 48 hours postoperatively and tested for cTNI within 1 hour using a VITROS immunoassay analyzer (Ortho Clinical Diagnostics, Raritan, USA). According to the manufacturer's instructions, the lower limit of cTNI using the Immunodiagnostic Troponin I ES test kit was 12 ng/L. The 99th percentile upper reference limit was 34 ng/L. Therefore, they set the standard for significant myocardial injury at 2380 ng/L. This association between the use of TTFM and myocardial injury was robust in the multivariate regression models (in all models, $p < 0.05$). Multiple logistic regression models were fit to estimate the relationship between the use of TTFM and myocardial events while adjusting for other independent variables. They performed three model fittings on the use of TTFM to confirm its stability, and the results indicated that the association between the use of TTFM and myocardial injury was still independently predicted. Fifty-nine people received TTFM, while 47 did not. In total, 7 (6.6%) had at least one grafting vessel obstruction. Only 1 patient where the TTFM was used had an occlusion graft vs. 6 patients where the TTFM was not used and had postoperative injury. In 2001, the use of TTFM techniques for assessing the quality of grafts intraoperatively, on the basis of the presence and volume of flow were clearly described (2).

Many years ago, in our initial experience in OPCAB in acute AMI, we learned the important role that plays the spread of a thrombus in relation to the recovery of the cardiac muscle, sometimes independent of the time; in those years, we didn't have any possibility to measure the flow and the quantification of the myocardial damage immediately (3–4) Using TTFM we can reconsider the most common use of OPCAB in situations of acute AMI where we can give the patient a better long-term survival, such as a Lima to LAD or arterial conduits in a young patient, or situations where we can do a MIDCAB and the variables, MINI OPCAB (lower middle incisions), or ROBOTIC operations (5, 6, 7, 8, 9, 10). A systematic review of the evidence and expert opinion statements, (11) concluded that although TTFM use may increase the cost and duration of the procedure and requires a learning curve, its cost/benefit ratio seems largely favorable, in view of the potential clinical consequences of graft dysfunction. These consensus statements will help to standardize the use of TTFM in clinical practice and provide guidance in clinical decision-making. Although the use of TTFM is around 30% of coronary operations, it is clear that there are different situations where the use is fundamental. For example, when you don't have total control of the graft because of the incision; or situations like the MINI OPCAB operation where the dissection of the mammary is limited (12)

In conclusion, the work of Zheng Quan MD et al. (1) remarks the importance of the use of TTFM to reduce the incidence of preoperative myocardial injury during off-pump coronary bypass surgery. Support of, in some ways, the recent expert opinion to promote the use of TTFM (10).

References

- 1 Zheng Quan, MD et al. The Use of Intraoperative Transit Time Flow Measurement Can Reduce Preoperative Myocardial Injury JACS-2022-ORIG-1076
- 2 Denton A. Cooley, MD, reviewed No. 2. Giuseppe D'Ancona, Hratch L. Karamanoukian, Marco Ricci, Tomas A. Salerno, Jacob Bergsland, editors, Intraoperative Graft Patency Verification in Cardiac and Vascular Surge PMC101218 Tex Heart Inst v.28 (4), 2001
- 3 Benetti et al., Acute Myocardial Infarction Surgery Without Extracorporeal Circulation, *Prensa Médica Argentina*, 71, pp. 555-1984.
- 4 Benetti F. J. Mariani M. A. Ballester C., Direct coronary surgery without cardiopulmonary bypass in acute myocardial infarction. *Journal of Cardiovascular Surgery* 1996; 37:391-5
- 5 Benetti et al. Basics principals of Minimally invasive Coronary Surgery Argentina's Medical Press, 1994-1981: 877-79
- 6 Benetti, F. J., and C. Ballester. use of thoracoscopy and a minimal thoracotomy in mammary-coronary bypass to the left anterior descending artery without extracorporeal circulation. *Journal of Cardiovascular*

Surgery, 36:159-161.

7 Method for Coronary Artery Bypass (MIDCAB) inventor F Benetti US Patent Number 5.888,247

8 Federico Benetti, Minimally Invasive Coronary Surgery (The Xiphoid Approach), European Journal of Cardio-Thoracic Surgery, Vol. 16 (Suppl. 2), November 1999, Elsevier, S10-S11.

9 Xiphoid Access for cardiac surgical procedures FBenetti et al US Patent 6,199.556B1

10. Benetti et al Xiphoid lower-sternotomy approach for multivessel revascularization of the left internal mammary artery to the left anterior descending artery and right internal mammary artery inflow to the other vessels. Heart Surg Forum. 2010 Feb;13(1):E36-9. doi: 10.1532/HSF98.20091131

11 Mario Gaudino et al The Use of Intraoperative Transit Time Flow Measurement for Coronary Artery Bypass Surgery Systematic Review of the Evidence and Expert Opinion Statements Circulation. 2021;144:1160–1171. DOI: 10.1161/CIRCULATIONAHA.121.054311

12 Federico j Benetti et al MINI OPCAB operation Surgical Technique Surgical technology international Volume 38 PMID 33755939,doi:10.52198/21.sti.38.cv1400