Early Diagnosis of Myocardial Infarction in Patients with a History of Coronary Artery Bypass Grafting

Luca Koechlin, MD[a,b,c]; Jasper Boeddinghaus, MD[a,c,d]; Thomas Nestelberger, MD[a,c]; Desiree Wussler, MD[a,c,d]; Joan Walter, MD[a,c,d]; F. Javier Martin-Sanchez, MD[c,e]; Nicolas Geigy, MD[f]; Dagmar I. Keller, MD[g]; Raphael Twerenbold, MD[a,c]; Christian Mueller, MD[a,c] for the APACE investigators[#]

[a] Cardiovascular Research Institute Basel (CRIB) and Department of Cardiology, University Hospital Basel, University of Basel, Switzerland; [b]Department of Cardiac Surgery, University Hospital Basel, University of Basel, Switzerland; [c]GREAT network; [d]Division of Internal Medicine, University Hospital Basel, University of Basel, Switzerland; [e]Servicio de Urgencias, Hospital Clínico San Carlos, Madrid, Spain; [f] Emergency Department, Kantonsspital Liestal, Switzerland; [g]Emergency Department, University Hospital Zurich, Zurich, Switzerland;

Short Title: Diagnosis of MI in patients after CABG

Word count: 746

Funding

This work was supported by research grants from the Swiss National Science Foundation, the Swiss Heart Foundation, the KTI, the European Union, the Stiftung für kardiovaskuläre Forschung Basel; Abbott, Beckman Coulter, Biomerieux, Brahms, Roche, Siemens, and Singulex.

The authors designed the study, gathered and analyzed the data, vouched for the data and analysis, wrote the paper, and decided to publish. Drs. Koechlin, Boeddinghaus, Twerenbold and Mueller had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. All authors have read and approved the manuscript. The sponsors had no role in designing or conducting the study and no role in gathering or analyzing the data or writing the manuscript. The manuscript and its contents have not been published previously and are not being considered for publications elsewhere in whole or in part in any language, including publicly accessible web sites or e-print servers.

We disclose that Dr. Koechlin received a research grant from the University of Basel, the Swiss Academy of Medical Sciences and the Gottfried and Julia Bangerter-Rhyner Foundation, as well as the "Freiwillige Akademische Gesellschaft Basel". Dr. Boeddinghaus received research grants from the University of Basel, the Division of Internal Medicine, the Swiss Academy of Medical Sciences and the Gottfried and Julia Bangerter-Rhyner Foundation, as well as speaker/consulting honoraria from Siemens and Roche Diagnostics, outside of the submitted work. Dr. Walter reports a research grant from the Swiss Academy of Medical Sciences and the Bangerter Foundation. Dr. Twerenbold received research support from the Swiss National Science Foundation (P300PB-167803/1), the University of Basel and the University Hospital of Basel and speaker honoraria/consulting honoraria from Abbott, BRAHMS Thermo Scientific, Roche, Siemens and Singulex, outside of the submitted work. Dr. Mueller has received research support from the Swiss National Science Foundation, the Swiss Heart Foundation, the KTI, the Stiftung für kardiovaskuläre Forschung Basel; Abbott, Alere, Astra Zeneca, Beckman Coulter, Biomerieux, Brahms, Roche, Siemens, Singulex, Sphingotec, and the Department of Internal Medicine, University Hospital Basel, as well as speaker honoraria/consulting honoraria from Abbott, Alere, Astra Zeneca, Biomerieux, Boehringer Ingelheim, BMS, Brahms, Cardiorentis, Novartis, Roche, Siemens, and Singulex.

All other authors declare that they have no conflict of interest with this study. The investigated hs-cTn assay were donated by the manufacturers, who had no role in the design of

the study, the analysis of the data, the preparation of the manuscript, or the decision to submit the manuscript for publication.

Address for correspondence
Prof. Dr. Christian Müller, CRIB and Department of Cardiology, University Hospital Basel, Petersgraben 4, CH-4031 Basel, Switzerland
Phone Number: +41 61 328 65 49; Fax number: +41 61 265 53 53
E-mail: christian.mueller@usb.ch

Acknowledgements
We are indebted to the patients who participated in the study and to the emergency department staff as well as the laboratory technicians of all participating sites for their most valuable efforts.

Keywords: diagnosis of AMI, CABG, cardiac surgery, hs-cTn, ESC 0/1h-algorithm

Clinical Trial Registration: https://clinicaltrials.gov/ct2/show/NCT00470587, number NCT00470587

Abbreviations

AMI – Acute myocardial infarction
CAD – Coronary artery disease
CABG – Coronary artery bypass grafting
hs-cTn – High-sensitivity cardiac troponin
MI – Myocardial infarction
NSTEMI – Non-ST-segment elevation myocardial infarction
PCI – Percutaneous coronary intervention

Word count: 746 words

Prompt identification of acute myocardial infarction (AMI) may be particularly challenging in patients with prior coronary artery bypass grafting (CABG). The impact of prior CABG on the diagnostic performance of high-sensitivity cardiac troponin (hs-cTnT/I) concentrations and the European Society of Cardiology (ESC) 0/1h-algorithms is unknown.

To address this major gap in knowledge, we performed a secondary analysis from a prospective international multicentre study enrolling adult patients presenting to the emergency department with symptoms suggestive of AMI (ClinicalTrials.gov registry, NCT00470587).(1) Patients on chronic dialysis, an unknown diagnosis after final adjudication and at least one elevated hs-cTnT level possibly indicating AMI, as well as patients with chest pain onset or peak >12 hours before presentation were excluded. According to the intended use, patients with ST-segment elevation myocardial infarction (STEMI) were excluded when analyzing the diagnostic performance of the ESC 0/1h-algorithms.(2,3) Final diagnoses were adjudicated by two independent cardiologists applying the fourth universal definition of AMI using all available medical records, cardiac imaging information, as well as study-specific assessments.(4)

Overall, 4015 patients were prospectively enrolled and eligible for the analysis of AMI prevalence. Of these, 3860 patients qualified for the analysis of the diagnostic performance of hs-cTnT/I concentrations, and 3054 patients for analysis of the hs-cTnT ESC 0/1h-algorithm.

Patients with prior CABG were older, more often men, more often had prior AMI and known peripheral vascular disease, prior percutaneous coronary intervention, and known cardiovascular risk factors. The prevalence of AMI was significantly higher in patients with previous CABG (35% versus 18%; $p<0.001$). Patients with prior CABG had significantly higher concentrations of hs-cTnT/I at presentation compared to patients without previous CABG (e.g. hs-cTnT median (IQR) 19 (11, 42) ng/L versus 8 (4, 19) ng/L, $p<0.001$), which was exclusively due to higher concentrations in patients with final diagnoses other than AMI

including heart failure and rhythm disorders (e.g. hs-cTnT median (IQR) 13 (9, 23) versus 6 (4, 11) ng/L; p<0.001). Patients with AMI had much higher hs-cTnT/I concentrations as compared to those with other final diagnoses, irrespective of prior CABG. The size of the index AMI as quantified by peak local cTnT/I concentrations and peak study-specific hs-cTnT/I concentrations was smaller in patients with prior CABG as compared to those without prior CABG (e.g. hs-cTnT/99th percentile median (IQR) ratio 5.2 (2.6, 13.6) versus 7.4 (3.2, 20.9), p=0.006), which might possibly be related to the increased collateral flow provided by the bypass grafts.

The diagnostic accuracy of hs-cTnT/I concentrations at presentation was high in patients with prior CABG, but significantly lower compared to patients without prior CABG (hs-cTnT: AUC 0.87 [95%CI 0.82-0.91] versus AUC 0.94 [95%CI 0.93-0.95], p=0.001; hs-cTnI: AUC 0.85 [95%CI 0.81-0.89] versus AUC 0.94 [95%CI 0.93-0.95]; p<0.001). In patients with prior CABG, the ESC hs-cTnT 0/1h-algorithm maintained very high negative predictive value (100 (94.6-100)%) and high positive predictive value (90.6 (81.0-95.6)%), but had lower efficacy with more patients remaining in the observe zone (50% versus 21% compared to patients without prior CABG; p<0.001). Given the high percentage of patients with prior CABG remaining in the observe zone, it is important to highlight the critical importance of detailed clinical assessment, hs-cTn re-sampling at 3h, transthoracic echocardiography, and often also coronary angiography in this subgroup of patients.

In conclusion, history of CABG substantially impacts on AMI incidence and the diagnostic accuracy of hs-cTnT/I, while the safety of the hs-cTnT ESC 0/1h-algorithm remains very high.

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Figure Legend

Figure 1. Diagnostic performance of hs-cTn and the ESC hs-cTnT 0/1h-algorithm

Diagnostic accuracy of hs-cTnT/I concentrations at presentation for the diagnosis of AMI according to the presence or absence of prior CABG (A). Diagnostic performance of the ESC hs-cTnT 0/1h-algorithm in patients with prior CABG (B).

NSTEMI – Non-ST-elevation myocardial infarction

Sens. – Sensitivity

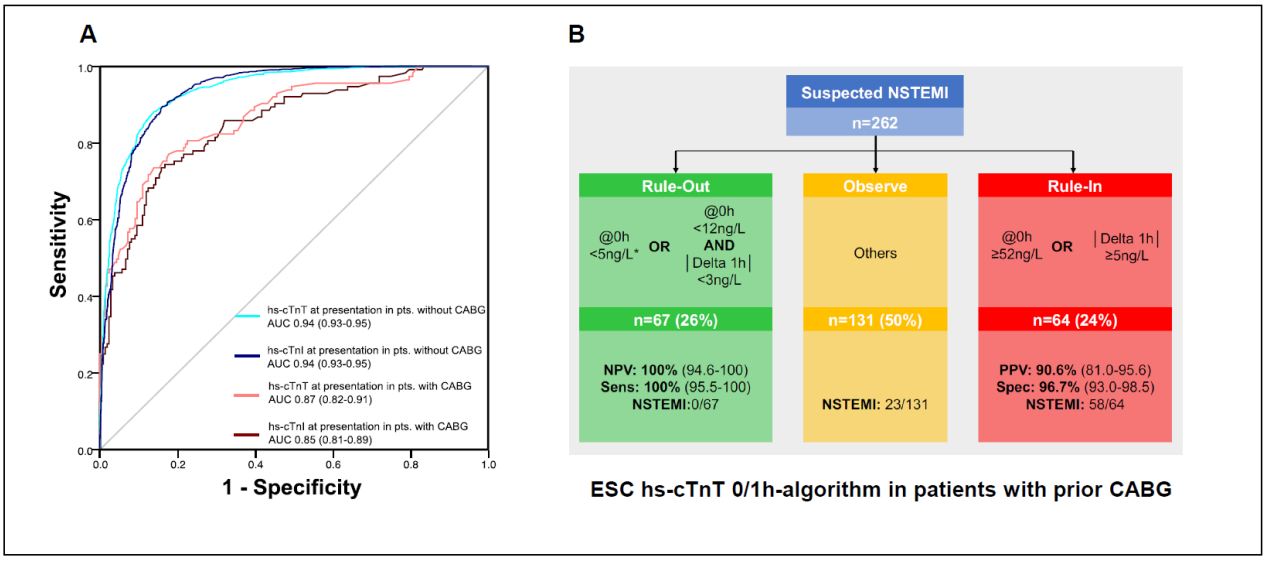
Spec. – Specificity

NPV – negative predictive value,

PPV – positive predictive value,

hs-cTnT/I – high-sensitivity cardiac troponin T/I

* if chest pain onset >3h



[#]Additional APACE Investigators and contributors to this manuscript:

Tobias Reichlin, MD[a,b,c]; Tobias Zimmermann, MD[a,b]; Mario Meier, MD[a,b]; Valentina Troester, MD[a,b]; Jeffrey Huber, MD[a,d]; Michael Christ, MD[a,d]; Patrick Badertscher, MD[a,b,e]; Karin Wildi, MD[a,b,f,g]; Christian Puelacher, MD, PhD[a,b]; Jeanne du Fay de Lavallaz, MD[a,b]; Maria Rubini Giménez, MD[a,b,h]; Ivo Strebel, MSc[a,b]; Nikola Kozhuharov, MD[a,b]; Danielle M. Gualandro, MD[a,b]; Eliska Potlukova, MD, PhD[a,b]; Katharina Rentsch, PhD[i]; Òscar Miró, MD[b,j]; Carolina Fuenzalida, MD[b,j]; Samyut Shrestha, MD[a,b,k]; Damian Kawecki, MD[b,l]; Beata Morawiec, MD[b,l]; Piotr Munzk, MD[b,l]; Tobias Breidthardt, MD[a,b,k]; Dayana Flores, MD[a,b]; Michael Freese, SN[a,b]; Claudia Stelzig, MS[a,b]; Caroline Kulangara, PhD[a,b]; Kathrin Meissner, RN[a,b]; Gregor Fahrni, MD[a,b]; Eleni Michou, MD[a,b]; Stefan Osswald, MD[a,b]; Raban Jeger, MD[a,b]; Christoph Kaiser, MD[a,b]; Beatriz López, MD[b,m]; Sofia Calderón, MD[b,m]; Esther Rodriguez Adrada, MD[b,n]; Eva Ganovská, MD[b,o]; Jiri Parenica[b,o], MD Arnold von Eckardstein, MD[p]; Isabel Campodarve, MD[q]. Joachim Gea, MD; Oliver Reuthebuch, MD[s]; Martin Grapow, MD[s]; Friedrich Eckstein, MD[s];

[a] Cardiovascular Research Institute Basel (CRIB) and Department of Cardiology, University Hospital Basel, University of Basel, Switzerland; [b] GREAT network; [c] Department of Cardiology, Inselspital, University of Bern, Switzerland; [d]Emergency Department, Kantonsspital Luzern, Switzerland; [e]Department of Cardiology, University of Illinois at Chicago, United States; [g]Critical Care Research Group, the Prince Charles Hospital, Brisbane, Australia; [h]University of Queensland, Brisbane, Australia; [h]Herzzentrum Leipzig, Cardiology Department, Germany; [i]Laboratory Medicine, University Hospital Basel, Switzerland; [j]Emergency Department, Hospital Clinic, Barcelona, Catalonia, Spain; [k]Department of Internal Medicine, University Hospital Basel, University of Basel, Switzerland; [l]2nd Department of Cardiology, School of Medicine with the Division of Dentistry in Zabrze, Medical University of Katowice, Poland; [m] Emergency Department, Hospital Clinic, Barcelona, Catalonia, Spain; [n]Servicio de Urgencias, Hospital Clínico San Carlos, Madrid, Spain; [o]Department of Cardiology, University Hospital Brno, Brno, Czech Republic and Medical Faculty, Masaryk University, Brno, Czech Republic; [p]Department of Laboratory Medicine, University Hospital Zurich, Zurich, Switzerland; [q]Emergency Department, Hospital del Mar, Barcelona, Spain; [r] Hospital del Mar, IMIM, Barcelona, Spain; [s]Department of Cardiac Surgery, University Hospital Basel, University of Basel, Switzerland;