Göteborg, 2022

Catching broken hearts

Electrocardiography and in-hospital outcome in Takotsubo syndrome and ST elevation myocardial infarction

AKADEMISK AVHANDLING

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademin, Göteborgs universitet kommer att offentligen försvaras i hörsal M 106 Karl Isaksson, Medicinaregatan 16, den 2 december 2022, klockan 09:00

av Rickard Zeijlon

Fakultetsopponent:

Professor Mark Petrie

Cardiovascular & Metabolic Health, University of Glasgow, Scotland

Avhandlingen baseras på följande delarbeten

I. Jha S, Zeijlon R, Enabtawi I, Shekka Espinosa A, Chamat J, Omerovic E, Redfors B. Electrocardiographic predictors of adverse in-hospital outcomes in the Takotsubo syndrome. *Int J Cardiol* 2020; 299: 43-18.

II. Zeijlon R, Chamat J, Enabtawi I, Jha S, Mohammed MM, Wågerman J, Le V, Shekka Espinosa A, Nyman E, Omerovic E, Redfors B. Risk of in-hospital life-threatening ventricular arrhythmia or death after ST-elevation myocardial infarction versus the Takotsubo syndrome. *ESC Heart Failure* 2021; 8: 1314-1323.

III. Zeijlon R, Chamat J, Le V, Wågerman J, Enabtawi I, Jha S, Mohammed MM, Shekka Espinosa A, Angerås O, Råmunddal T, Omerovic E, Redfors B. ECG differences and ECG predictors in patients presenting with ST segment elevation due to myocardial infarction versus takotsubo syndrome. *IJC Heart & Vasculature* 2022; 40: 101047.

IV. Zeijlon R, Jha S, Le V, Chamat J, Shekka Espinosa A, Poller A, James Thorleifsson S, Bobbio E, Mellberg T, Pirazzi C, Gudmundsson T, Martinsson A, Angerås O, Råmunddal T, Omerovic E, Redfors B. Temporal electrocardiographic changes in anterior ST elevation myocardial infarction versus the Takotsubo syndrome. *Submitted to journal.*

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Electrocardiography and in-hospital outcome in Takotsubo syndrome and ST elevation myocardial infarction

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ABSTRACT

Background and aims: Takotsubo syndrome (TS) and acute myocardial infarction (AMI) have similar symptoms, non-invasive test results and complications. Whereas AMI is caused by cardiac ischemia, the pathophysiology of TS is incompletely understood. Because TS and AMI can present with ST elevation, electrocardiography (ECG) in TS is difficult to distinguish from ST elevation myocardial infarction (STEMI). The aim of this thesis was to compare ECG and outcome between TS and STEMI, and to put these observations into perspective of the pathophysiology of TS. **Methods:** All TS patients treated at Sahlgrenska University Hospital (Gothenburg, Sweden) and reported in the Swedish Coronary Angiography and Angioplasty Registry (2008 to 2019) were identified (study I) and matched based on age and sex with STEMI patients (studies II and III). Medical charts, angiography, echocardiography, arrhythmia and ECG were analysed. In study I, the association between T wave inversion and in-hospital Major Adverse Cardiac Events (MACE) was investigated. In study II, life-threatening ventricular arrhythmia (LTVA) or death within 72 hours was investigated in TS versus STEMI. In study III, admission ECG, and ECG predictors of LTVA or death, were compared between ST elevation Takotsubo syndrome (STE-TS) and STEMI. In study IV, TS and anterior STEMI patients were prospectively enrolled to validate the results in study III, and to analyse temporal ECG. **Results:** The risk of LTVA within 72 hours was lower in TS than in STEMI (study II, N=465). ST deviation magnitude predicted *higher* risk of LTVA or death within 72 hours in STEMI (study III, N=378), whereas T wave inversion predicted *lower* risk of in-hospital MACE in TS (study I, N=215). In study III, admission ECG was similar in STE-TS and left anterior descending artery (LAD) STEMI. In temporal analysis (study IV, N=130), the similarities between TS and anterior/LAD STEMI from study III were confirmed, and similarities of T wave inversion were emphasized. **Conclusions:** The risk of LTVA within 72 hours was lower in TS than in STEMI. Admission/temporal ECG was similar, but ECG predictors of outcome were different, in TS compared with anterior/LAD STEMI. This thesis indicate that ECG cannot safely distinguish TS from STEMI. Lastly, the observations of the present thesis may indicate a “transient ischemic” pathophysiology of TS. **Keywords:** Takotsubo syndrome, ST elevation myocardial infarction, electrocardiography, arrhythmia, mortality, pathophysiology.

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