

Sonothrombolysis in the Ambulance

Early treatment for Acute Myocardial Infarction

Drs Soufiane El Kadi, MD-researcher

Dr Otto Kamp, cardiologist



Background

Numbers 2017:

- 34.000 patients with myocardial infarction admitted to hospital
- 14 death cases per day (8 men, 6 women)
- 1/3 of patients with myocardial infarction develops heart failure in the years after infarction

<https://www.hartstichting.nl/hart-en-vaatziekten/feiten-en-cijfers-hart-en-vaatziekten>

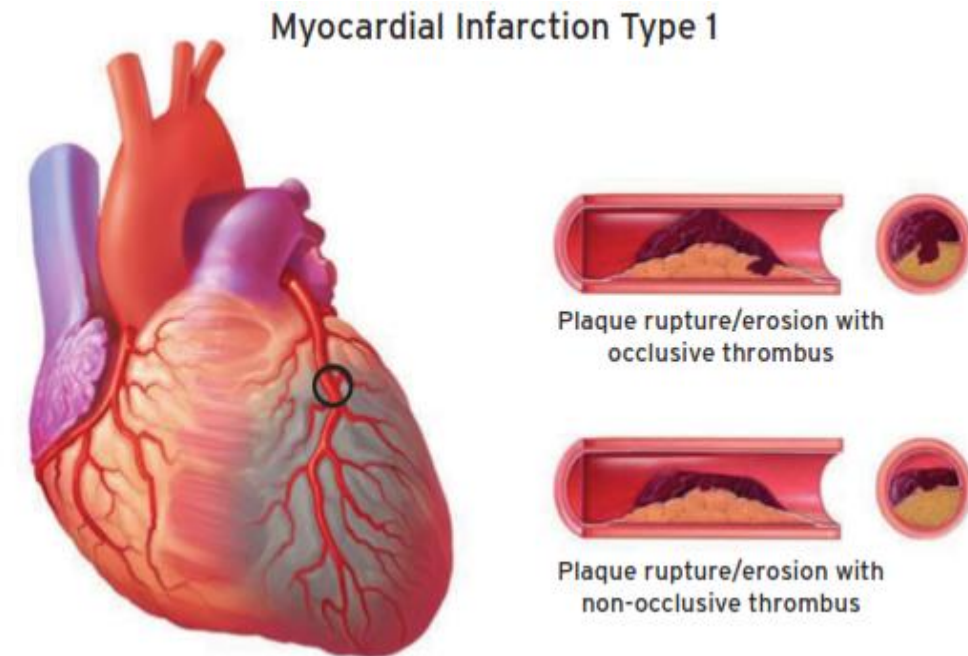


Background

Subdivision Acute Myocardial Infarction:

1. ST-elevation myocardial infarction (STEMI)
2. Non ST-elevation myocardial infarction (NSTEMI)
3. Unstable angina pectoris

ESC Fourth universal definition of myocardial Infarction (2018), European Heart Journal (2018) 00,1-33
doi:10.1093/eurheartj/ehy462





Background

Initial therapy STEMI:

- Oxygen ($sO_2 < 90\%$)
- Nitroglycerin
- Aspirin loading dose
- Ticagrelor 180mg (clopidogrel 600mg/prasugrel 60mg)
- IV Heparin bolus 5000EH (enoxaparin/bivalirudin)





Current challenges in STEMI

- Percutaneous coronary intervention (PCI) is a very effective treatment for STEMI

However ...

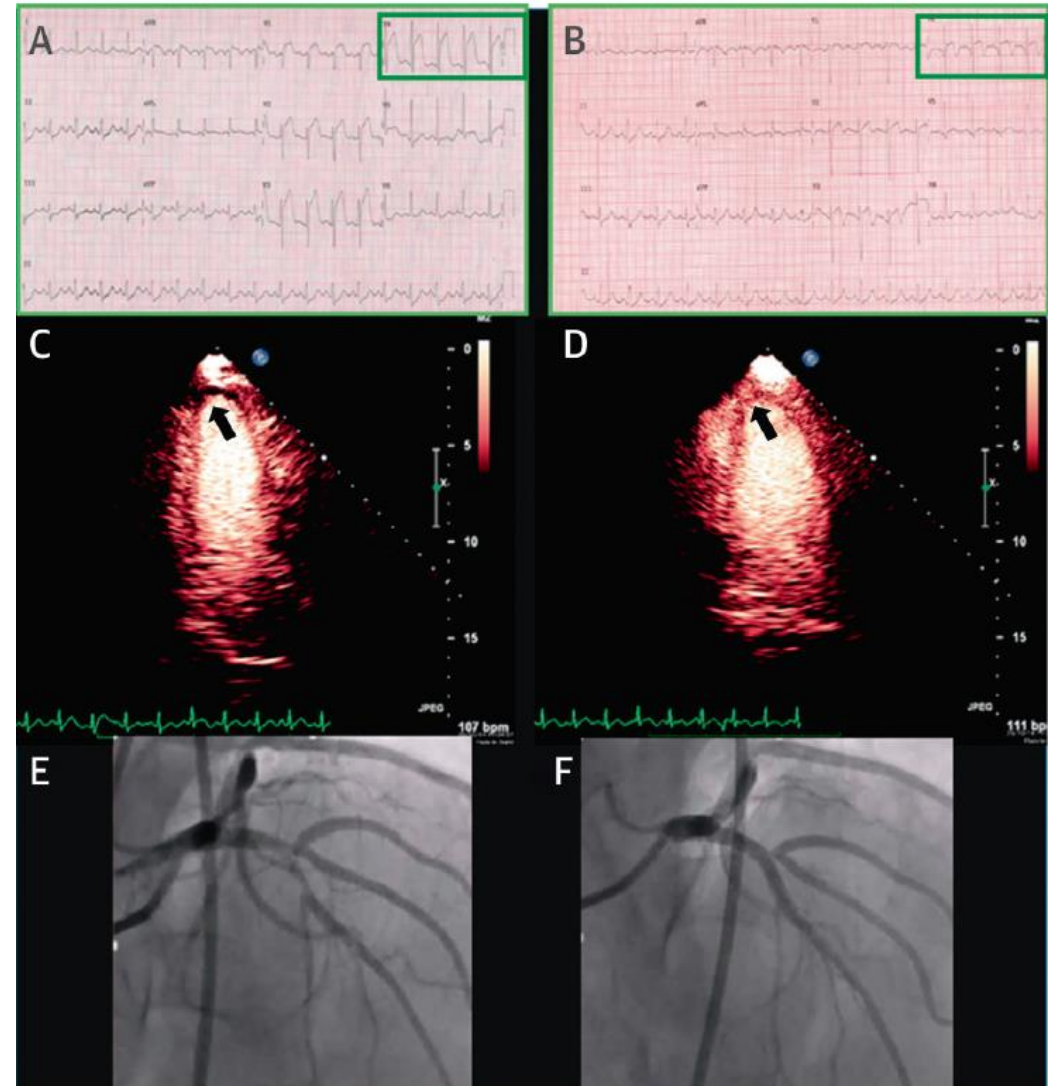
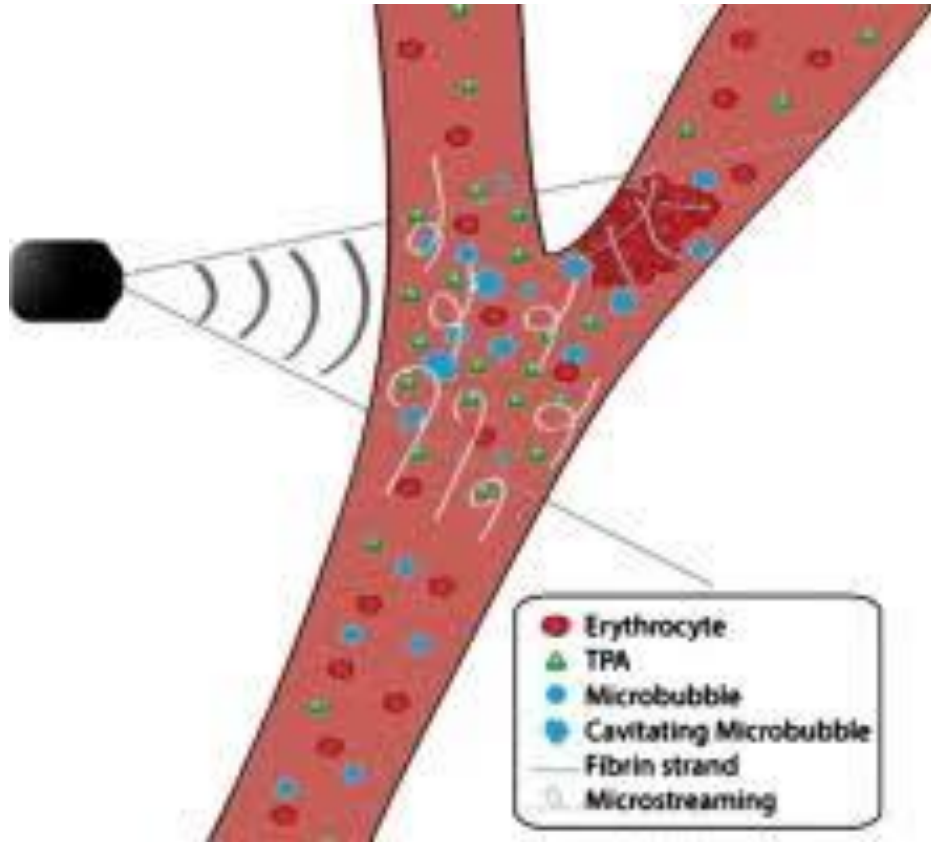
- Early reperfusion is restricted by delay in PCI initiation
- Despite successful recanalization, up to 50% of the patients have microvascular obstruction



Sonothrombolysis as novel treatment

- Contrast echocardiography with high mechanical index impulses is capable of thrombus dissolution (i.e. sonothrombolysis) and improving (micro)vascular flow (sonoperfusion)
- Adjunctive therapeutic use of contrast echocardiography for STEMI is feasible and effective

Incorporation of sonothrombolysis in the ambulance may lead to early reperfusion and tackling of microvascular obstruction



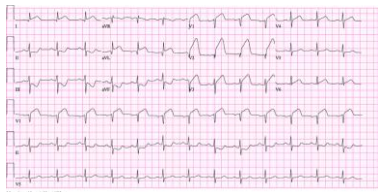
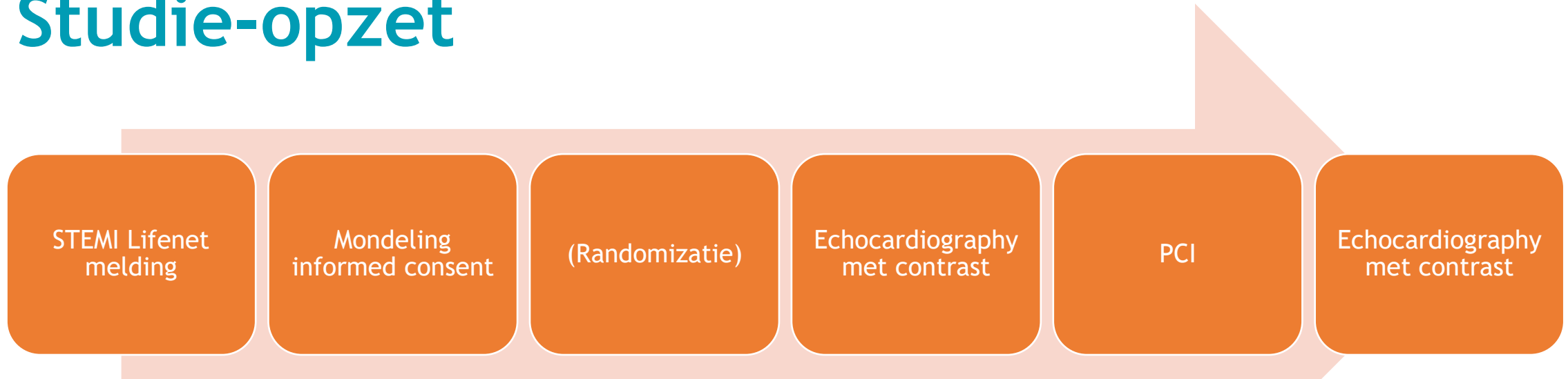


Aim

- Safety and feasibility of in-ambulance sonothrombolysis (STEMI)
- Efficacy in achieving...
 - Coronary reperfusion
 - Reduction of microvascular obstruction
- Simultaneous improvement of design and technology ultrasound probe
 - End-result: life-jacket with integrated probe and defibrillator pads



Studie-opzet







Points of focus

- Effective application sonothrombolysis
 - Time and duration
 - Quality
- Adequate training ambulance personnel
- Individualized treatment (sex/size)

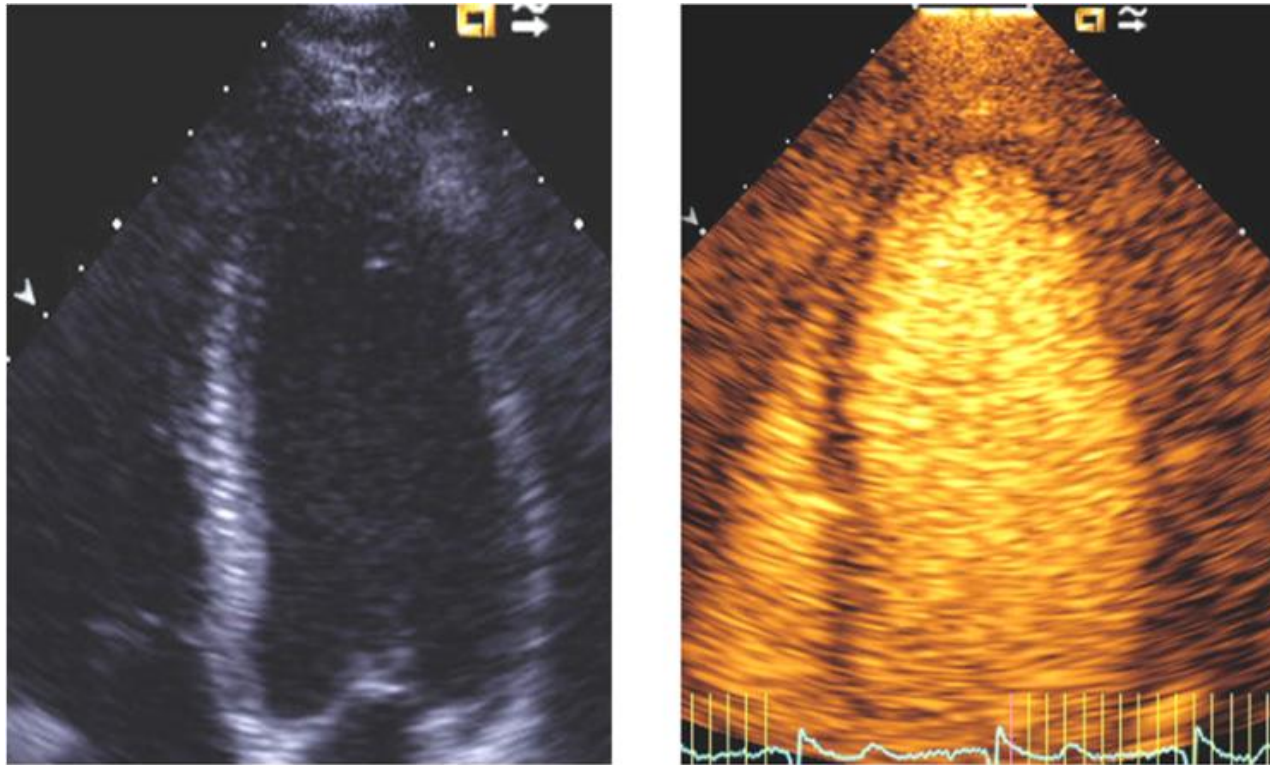


Figure 1. Sonothrombolysis set-up in the ambulance

The Philips CX-50 ultrasound machine in a holder of stainless steel mounted on the inner side of the ambulance with the mobile cooling device and Luminity vials underneath, and the Vialmix kept in one of the compartments at the left.



Contrast-echo



Gain:
Laag

Mechanische index (MI) :
Laag bij visualiseren (0.3-0.5)
Hoog bij toedienen pulsen (1.2-1.4)

Case

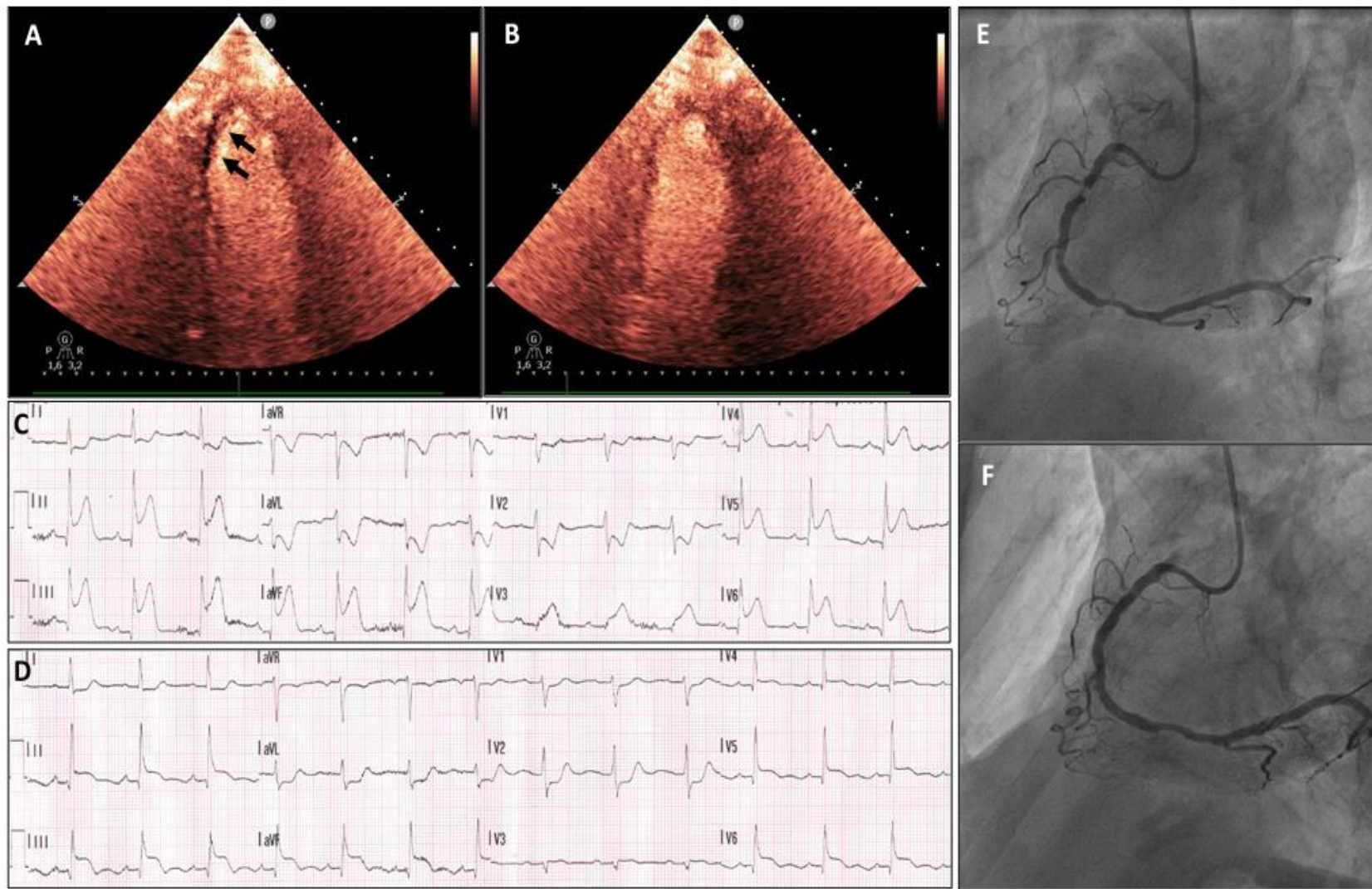
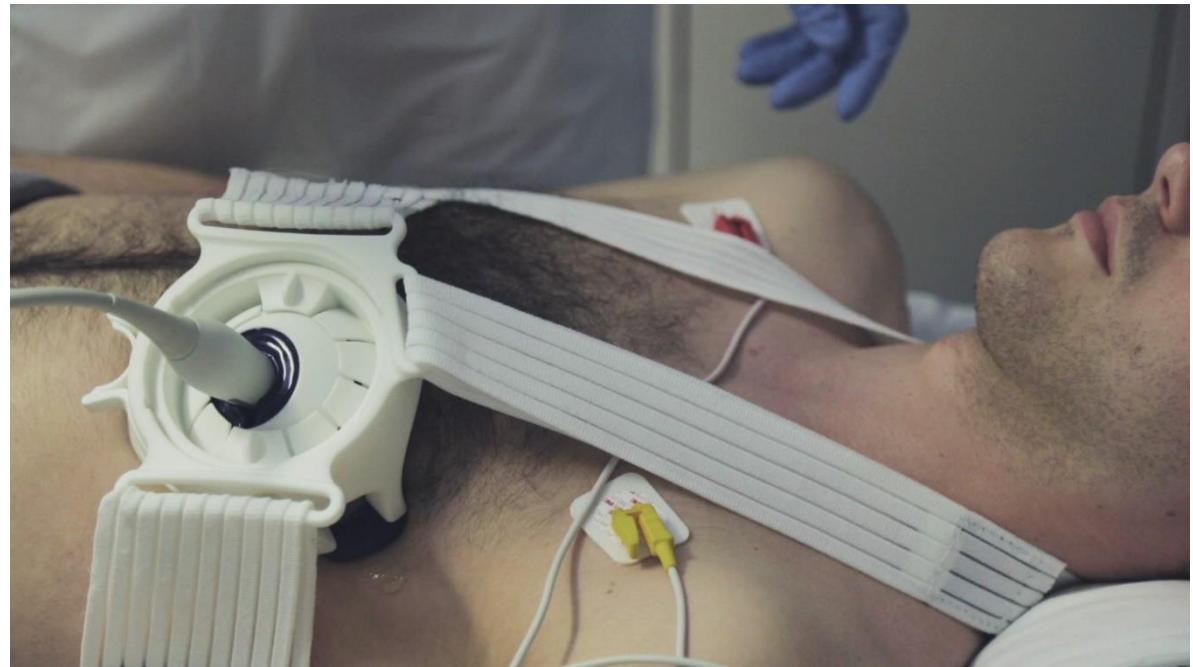


Figure 2. Case 1: pre-hospital sonothrombolysis in a patient with inferolateral STEMI

A: contrast echocardiography of the apical two-chamber view with a perfusion defect inferior (arrows) B: clearance of the perfusion defect after approximately 10-minute sonothrombolysis in the ambulance C: ST-segment elevations in the inferior and lateral leads and V3R (V3) on ECG with reciprocal depressions in I, aVL, V1-V2 D: Partial resolution of the ST-deviations E: Initial angiography shows TIMI-II flow of the RCA with subtotal occlusion of the proximal RCA F: TIMI-II flow after PCI of the proximal RCA.



Future?





Questions

