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SUCCESSFUL CARDIOPULMONARY RESUSCITATION USING A DEFIBRILLATOR PLACED IN A PUBLIC PLACE - CASE REPORT

Vuk Nikovic[1], Kenan Erovic[2], Anton Laggner[3], Dusica Gujanicic[4], Vladimir Gajic[5]
[1]Institute for Emergency Medicine Montenegro, Podgorica, Montenegro
[2]General Hospital, Bijelo Polje, Montenegro
[3]Medical University of Vienna, AKH Hospital, Department of Emergency Medicine, Vienna, Austria
[4]University Clinical Center of Serbia, Emergency Center, Belgrade, Serbia
[5]Institute for Emergency Medicine, Kragujevac, Serbia

USPJEŠNA KARDIOPULMONALNA REANIMACIJA UPOTREBOM DEFIBRILATORA POSTAVLJENOG NA JAVNOM MJESTU – PRIKAZ SLUČAJA

Vuk Nikovi[1], Kenan Erović[2], Anton Laggner[3], Dušica Gujaničić[4], Vladimir Gajić[5]
[1]Zavod za Hitnu medicinsku pomoc Crne Gore, Podgorica, Crna Gora
[2]Opšta bolnica, Bijelo Polje, Crna Gora
[3]Medicinski univerzitet Beč, AKH Bolnica, Odsek za hitnu medicinsku pomoć, Beč, Austrija
[4]Univerzitetski klinički centar Srbije, Urgentni centar, Beograd, Srbija
[5]Zavod za urgentnu medicinu, Kragujevac, Srbija

ABSTRACT

Early defibrillation of shockable rhythms is associated with improved survival, but ensuring timely access to defibrillators has been a significant challenge. To date, the development of public-access defibrillation programs, involving the deployment of automated external defibrillators into the public space, has been the main strategy to address this challenge. The case of a 47-year-old man with acute myocardial infarction and VF is presented. Outpatient protocol data, medical history, and discharge lists from the Emergency services, intensive care unit were analyzed. The patient felt nausea, dizziness, sweating. His daughter founds him on the floor unconscious, not breathing. She started resuscitation, and an ambulance was called. The police arrived first and used the AED defibrillator. VF was registered on the defibrillator monitor and a decision was made to apply a DC shock. The AED defibrillator delivered 5 shocks. After the DC shock, the patient began to breathe. The ambulance arrived after 6 minutes and continued with resuscitation. The patient was transported to the Emergency Center. ECG during transport showed a sinus rhythm of 100/min with ST segment elevation in V1-V5 and ST segment depression in V6. The patient was intubated. The therapy was: amiodarone amp. 150 mg/3 mL, 300 mg IV, fentanyl citrate inj. 100 mcg (0.1 mg) (2.0 mL), 0.3 mg IV, phenylephrine hydrochloride amp. 0.5 mg/5 mL, 0.4 mg IV, rocuronium bromide amp. 50 mg/5 mL, 80 mg IV, adrenaline amp. 2 mg/20 mL, 1 mg IV. In the Emergency Department, he had three episodes of ventricular tachycardia. After the successful cardioversion, the patient had a stable rhythm. The patient was prepared for PCI, LAD stenting. After catheterization, STENT implantation and stabilization, therapeutic hypothermia was administered with Cold Ringer lactate 500 ml at 4°C intravenously. The temperature was reduced to 33°C and maintained for 24 hours. The case shows that the sooner CPR is initiated, and defibrillation is performed, the better the outcome of out-of-hospital cardiac arrest caused by cardiac arrhythmia. This is a presentation of successful usage of AED in critically ill patients with malign arrhythmias in non-hospital conditions.

Key words: *heart arrest; cardiopulmonary resuscitation; electric countershock.*

SAŽETAK

Rana defibrilacija ritmova koji se mogu defibrilirati povezana je s poboljšanim preživljavanjem, ali je osiguravanje pravovremenog pristupa defibrilatorima bilo značajan izazov. Do danas razvoj javnih programa defibrilacije, koji uključuje postavljanje automatizovanih eksternih defibrilatora u javni prostor, bio je glavna strategija za rešavanje ovog izazova. Prikazan je slučaj 47-godišnjeg muškarca sa akutnim infarktom miokarda i VF. Analizirani su podaci ambulantnog protokola, anamneza i otpusne liste iz hitne pomoći, jedinice intenzivne nege. Pacijent je osjetio mučninu, vrtoglavicu, znojenje. Kćerka ga pronalazi na podu bez svijesti, ne diše. Otpočela je reanimaciju i pozvana je hitna pomoć. Policija dolazi prva i upotrebljava AED defibrilator. Na monitoru defibrilatora registruje se VF i donijeta je odluka o primeni DC šoka. AED defibrilator isporučuje pet šokova. Nakon DC šoka pacijent počinje da diše. Hitna dolazi nakon šest minuta i nastavlja s sa reanimacijom. Pacijent se prevozi u Urgentni centar. Tokom transporta EKG je pokazao sinusni ritam od 100/min sa elevacijom ST segmenta u V1-V5 i depresijom ST segmenta V6. Pacijent je intubiran. Terapija je bila: amhodaron amp. 150 mg/3 mL, 300 mg IV, fentanil citrat inj. 100 mcg (0,1 mg) (2,0 mL), 0,3 mg IV, fenilefrin hidrohlorid amp. 0,5 mg / 5 mL, 0,4 mg IV, rokuronijum bromid amp. 50 mg/5 mL, 80 mg IV, adrenalin amp. 2 mg/20 mL, 1 mg IV. U Hitnoj pomoći imao je tri epizode ventrikularne tahikardije. Nakon uspješne kardioverzije pacijent je imao stabilan ritam. Pripremljen je za PCI, stent na LAD. Nakon kateterizacije, implantacije STENT i stabilizacije, primijenjena je terapijska hipotermija sa hladnim Ringerovim laktatom 500 ml na 4°C intravenski. Temperatura je smanjena na 33°C i održavana je 24 sata. Rad prikazuje da što prije započne CPR i uradi se rana defibrilacija, to je bolji ishod vanbolničkog srčanog zastoja čiji je uzrok poremećaj srčanog ritma. Ovo je prikaz uspešne primene AED kod kritično bolesnih pacijenata s malignim aritmijama u vanbolničkom stanju.

Ključne riječi: *srčani zastoj; kardiopulmonalna reanimacija; defibrilacija.*

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Vuk Niković,
Institute for Emergency Medical Assistance of Montenegro,
Dalmatinska bb, 81000, Podgorica, Montenegro,
Tel. +38267514973,
E-mail: vuk.zhmp@gmail.com

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INTRODUCTION

Defibrillators are devices that send an electrical pulse or shock to the heart to restore normal heart function. They are used to prevent or correct arrhythmia, an irregular heartbeat that is too slow or too fast. If the heart stops suddenly, defibrillators can also help it beat again. Different types of defibrillators work in different ways. Automated external defibrillators (AEDs), found in many public spaces today, are used to save the lives of people who experience cardiac arrest. Even untrained bystanders can use these devices in an emergency. Defibrillation can help with: Pulseless ventricular tachycardia. Ventricular fibrillation, which is the most common cause of sudden cardiac arrest.

An AED is a lightweight, portable, battery-powered device that checks the heart's rhythm and sends a shock to the heart to restore a normal rhythm. The device is used to help people who have cardiac arrest. Adhesive pads with sensors, called electrodes, are attached to the chest of someone in cardiac arrest. The electrodes send information about the person's heart rhythm to the computer in the AED. A computer analyzes the heart rhythm to determine if an electric shock is needed. If necessary, electrodes deliver a shock (1, 2).

The aim of the work is to show the importance of the availability of AED defibrillators in public areas, and in this case in a police patrol vehicle, because the police are often the first to arrive at the scene. For example, in the United States, sudden cardiac arrest is among the leading causes of death. In fact, more than 350,000 people will experience cardiac arrest. Currently, the only way to restore a regular heart rhythm during cardiac arrest is to use an AED.

The time for first responders to call 911 is 8-12 minutes, and for every minute defibrillation is delayed, the chance of survival decreases by approximately 10%, making it critical that they have access to and know how to use an AED (3).

CASE REPORT

The 47 year old man felt nausea, dizziness, sweating. The daughter finds him on the floor unconscious, not breathing. She called his brother and he started to make resuscitation and he called emergency number. Police coming first and apply an AED defibrillator. A shock wave VF (ventricular fibrillation) is registered on the defibrillator monitor and decision was made to deliver a DC shock (Figures 1, 2). AED defibrillator delivers 5 shocks. The rhythm of cardiac arrest is VF (4) (Figure 1 and 2).

After delivered DC shock, the patient begins to breathe. Emergency coming after 6 minutes and continues resuscitation. The patient was transported to the Emergency Department. During the patients transport an ECG showed sinus rhythm of 100 bpm with ST segment elevation in V1-V5 and and ST segment depression of V6 (Figure 3). Vital parameters during the transport: GCS 11, SpO_2 90% , blood pressure is immeasurable.

The patient was intubated. Therapy was the following: amiodarone amp. 150 mg/3 mL, 300 mg IV, fentanyl citrate inj. 100 mcg (0.1 mg) (2.0 mL), 0.3 mg IV, phenylephrine hydrochloride amp. 0.5 mg/5 mL, 0.4 mg IV, rocuronium bromide amp. 50 mg/5 mL, 80 mg IV, adrenaline amp. 2 mg/20 mL, 1 mg IV (5). In Emergency Department he had three episodes of ventricular tachycardia (Figures 4, 5). After successful cardioversion, the patient had a stable rhythm.

Patient than was prepared for PCI with drugs, and with stable vital parameters and monitoring was transferred to a catheterization room where he received a stent on the LAD (Figures 6, 7, 8, 9). ECG after implantation STENT was showned in figure 10.

After characterization, implantation STENT and stabilization, therapeutic hypothermia was applied. Cold Ringer lactate 500 mL at 4°C was flushed. Temperature was decreased to 33°C and kept stabile for 24 hours (6) (Figure 11).

During on observation was done chest X-ray, CT of the torax, and CT of the head (Figures 12, 13, 14). During the observation was done transesophageal ECHO. (Figure 15). During the first 24 hours patient was observed and he had stable vital signs and neurological he was improving (7). After hypothermia, patient has been transferred to the intensive care unit so then cardiology department, where he fully recovered, after which he was discharged home (7).

DISCUSSION

The sooner CPR is started the better is the outcome. In the first 3 minutes the chance of return of spontaneous circulation is 75%. After 4 minutes is 40%. After 5 minutes the chance of return of spontaneous circulation is minimal. Current evidence supports that induction of therapeutic hypothermia in selected patients after cardiac arrest can improve neurological outcome (7). It is hoped that by summarizing the current state of knowledge on the subject and highlighting issues on clinical management will enable more patients to benefit from the therapy. Early CPR

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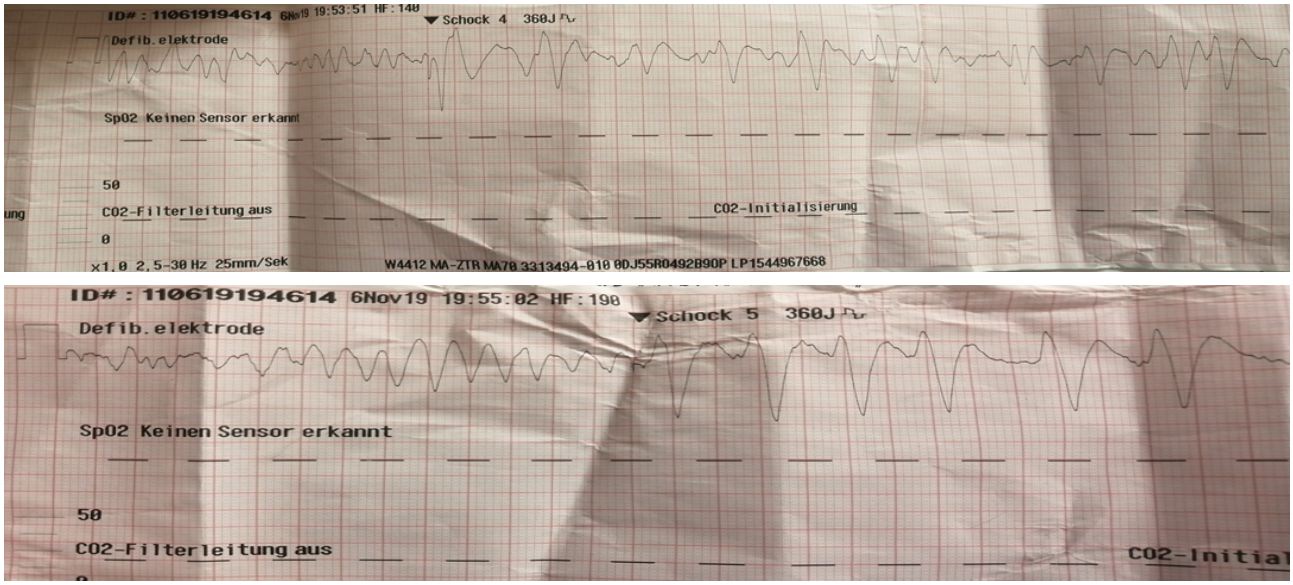

Figure 1,2. ECG with VF

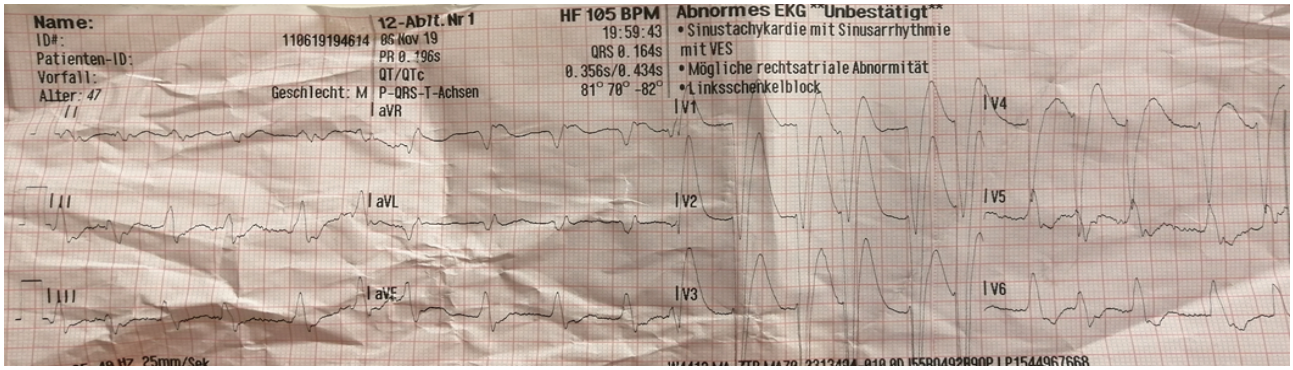

Figure 3. ECG after defibrillation

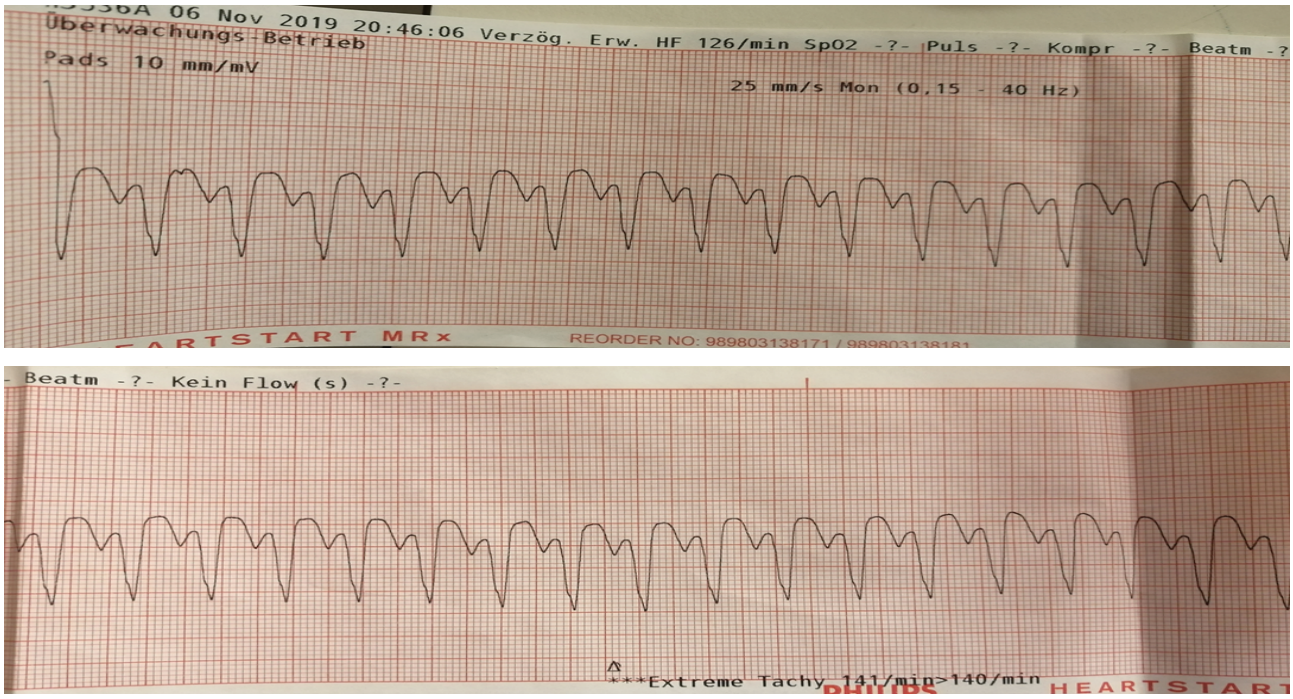

Figure 4,5. ECG with VT

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Figure 6. Angiography

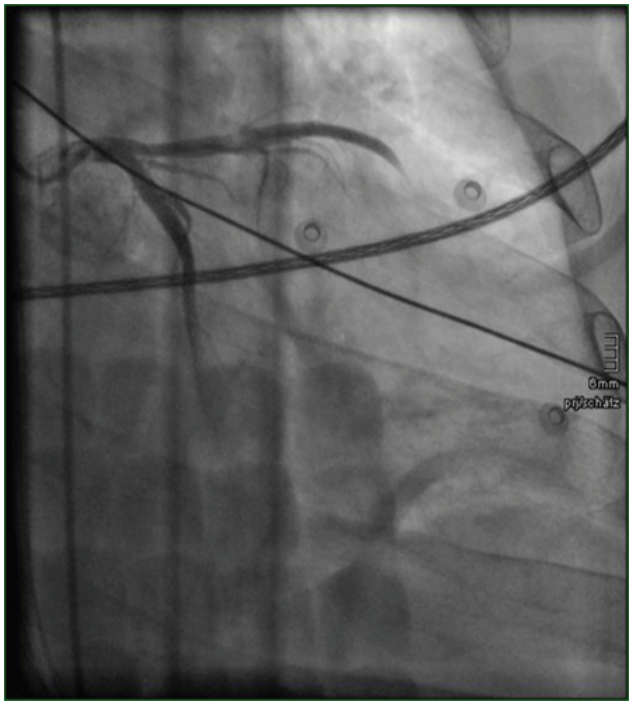

Figure 7. Occlusion on left coronary artery

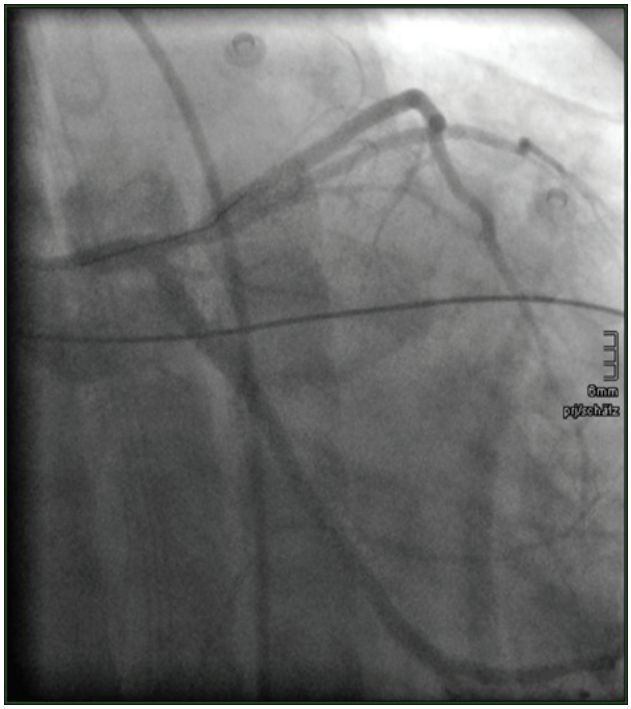

Figure 8. Left coronary artery after implantation STENT

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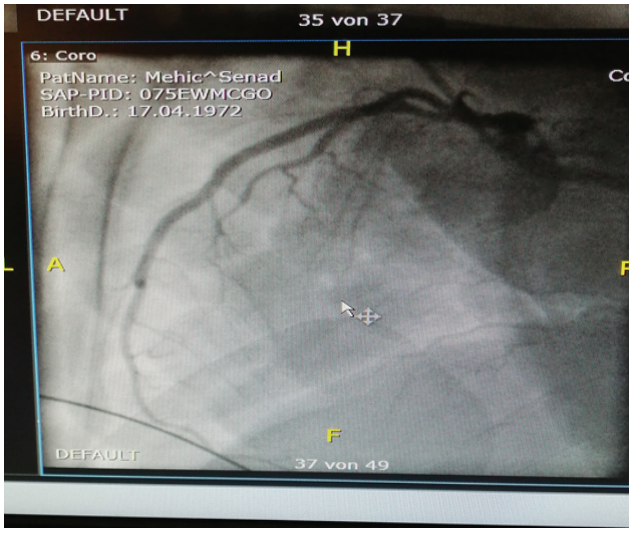

Figure 9. Right coronary artery

and defibrillation in first few minutes has the biggest impact in patient recovery/survival in terms of cardiac arrest due to malignant arrhythmias. Sudden cardiac arrest (SCA) is a frequent cause of death in the developed world. Early defibrillation, preferably within the first minutes of the incident, significantly increases survival rates. In countries with improved survival rates AEDs are more widely available and more of the public are trained in CPR (1-3). As call-to-arrival times are usually greater than 10 minutes, ambulances often arrive too late to successfully resuscitate most people with out-of-hospital SCA. The best chance of survival for a casualty with SCA is prompt access to an AED, this could lead to a significant reduction in mortality in both children and adults.

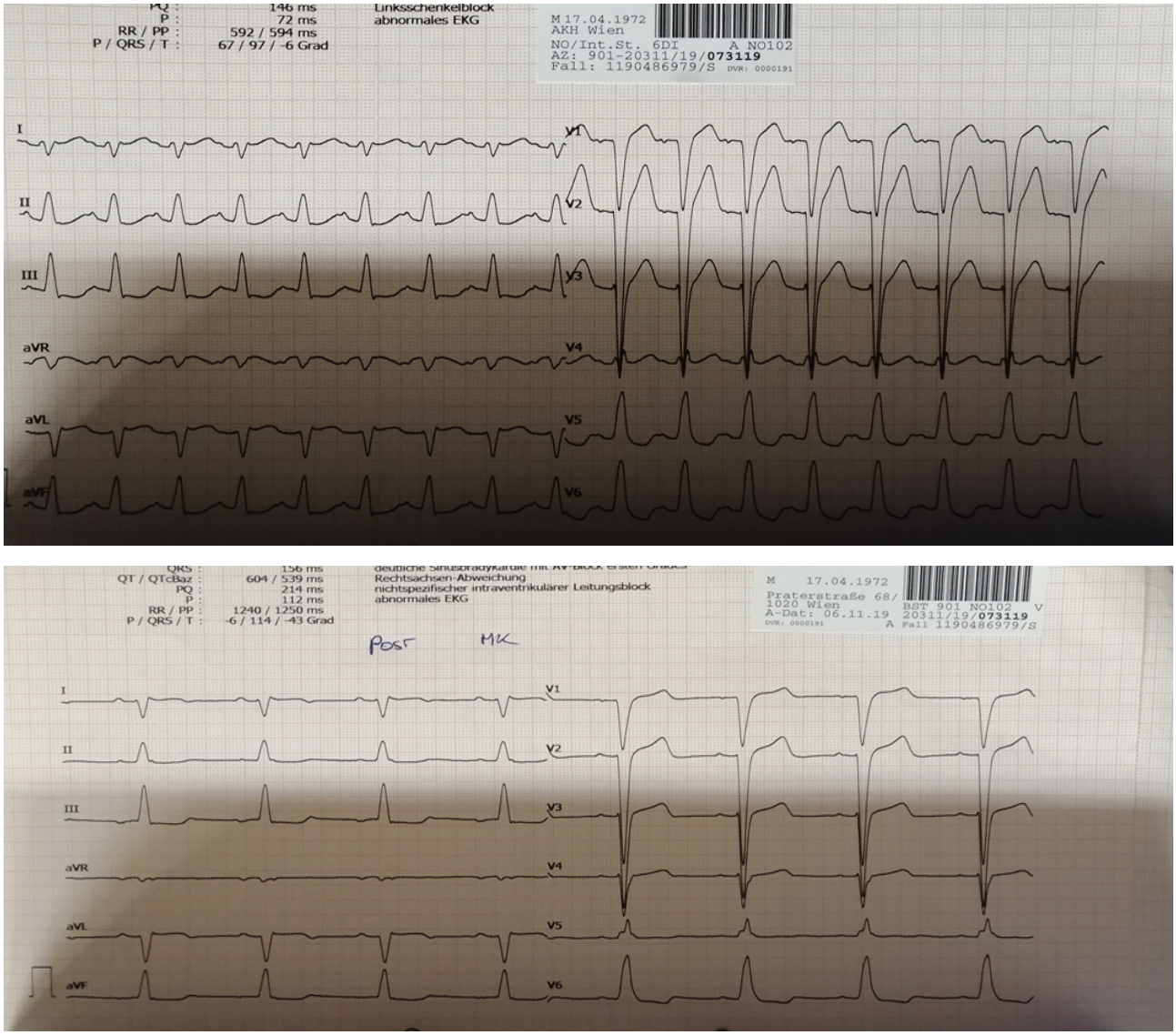

Figure 10. ECG after implantation STENT

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Figure 11. Patient after applied EMCOOL Spad and IV cooling

Figure 14. Head CT

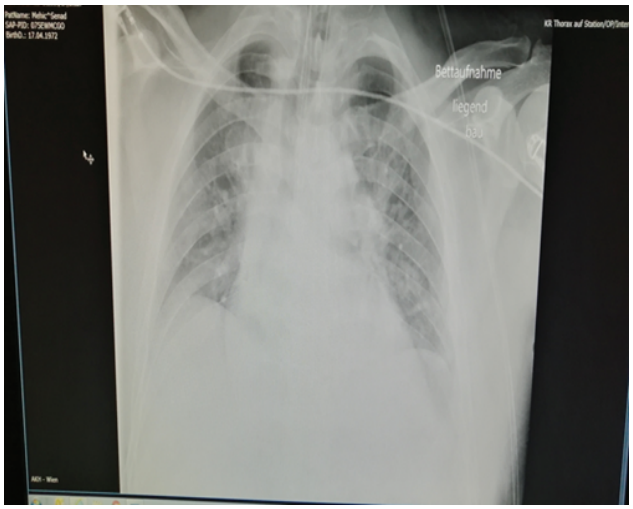

Figure 12. Pulmo X Ray

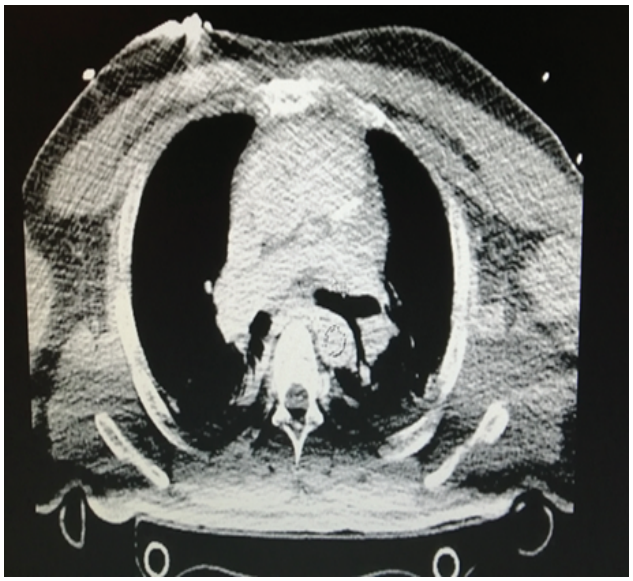

Figure 13. Thorax CT

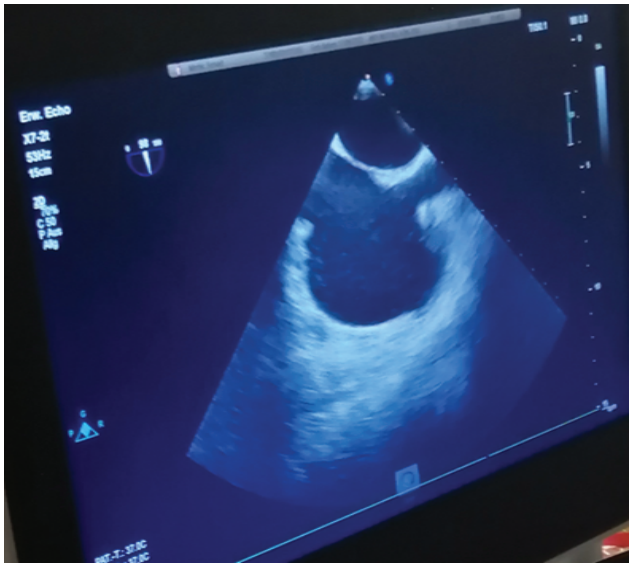

Figure 15. Transesophageal ECHO

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ABBREVIATIONS:

CPR - cardiopulmonary resuscitation

VT - ventricular tachycardia

DC – defibrillation

GCS – Glasgow coma scale

STENT - coronary stents

LAD - left anterior descending artery

PCI - percutaneous coronary intervention

ECG - electrocardiography

SpO2 - oxygen saturation

ECHO – echocardiogram

SCA - sudden cardiac arrest

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