Precordial thump as a life-saving resuscitation measure in obese patients during out-of-hospital cardiac arrest

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Abstract

Introduction: *The precordial thump was until recently recognized as a life-saving measure for confirmed and monitored shockable rhythm cardiac arrest cases when a defibrillator is not immediately available, but cardiopulmonary resuscitation guidelines no longer mention it.* **Objective:** *We present the precordial thump as a life-saving measure during cardiac arrest in an obese patient.* **Case report:** *An emergency medical team intervened in a 69-year-old man with complaints of chest pain lasting >1h. He was dyspneic, pale, and had clammy skin. Respiratory rate 18/min, oxygen saturation 89%, heart rate 76 beats per minute, blood pressure of 80/50 mmHg. Electrocardiogram: anterior ST elevation myocardial infarction with right bundle branch block. The patient was allergic to aspirin. He was treated with 180 mg of oral ticagrelor, 500 mL saline solution IV, and 4 L/min O2 using a mask and then underwent cardiac arrest. Before the defibrillator became available, the patient was treated with three precordial thumps, oropharyngeal airway placement, bag valve mask ventilation with 100% oxygen, and chest compressions. The monitor showed coarse ventricular fibrillation upon arrival of the biphasic defibrillator. A direct current shock with 200 J of energy was delivered. After the shock, the patient regained consciousness, pulse rate, and spontaneous breathing. The electrocardiogram monitor showed a sinus rhythm of 143 beats per minute, blood pressure 80/50 mmHg, and oxygen saturation 89%.* **Conclusion***: Although cardiopulmonary resuscitation guidelines no longer mention precordial thump, the question remains as to whether it could be an initial life-saving procedure during cardiac arrest in obese patients.*

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Keywords: *precordial thump, cardiopulmonary resuscitation, obesity*

El golpe precordial como medida de reanimación vital en pacientes obesos durante un paro cardiaco extrahospitalario

Resumen

Introducción: *El golpe precordial se reconocía hasta hace poco como una medida que salva vidas en los casos de parada cardiaca con ritmo desfibrilable confirmada y monitorizada cuando no se dispone inmediatamente de un desfibrilador, pero las guías de reanimación cardiopulmonar ya no lo mencionan.* **Objetivo:** *Presentamos el golpe precordial como medida de salvamento durante una parada cardiaca en un paciente obeso.* **Caso clínico:** *Un equipo médico de urgencias intervino en un hombre de 69 años que se quejaba de dolor torácico de más de 1 hora de duración. Estaba disneico, pálido y tenía la piel húmeda. Frecuencia respiratoria de 18/min, saturación de oxígeno del 89%, frecuencia cardiaca de 76 latidos por minuto, presión arterial de 80/50 mmHg. Electrocardiograma: infarto de miocardio con elevación anterior del ST y bloqueo de rama derecha. El paciente era alérgico a la aspirina. Se le trató con 180 mg de ticagrelor oral, 500 mL de solución salina IV y 4 L/min de O2 mediante mascarilla y, a continuación, sufrió una parada cardiaca. Antes de que el desfibrilador estuviera disponible, se trató al paciente con tres golpes precordiales, colocación de vía aérea orofaríngea, ventilación con máscara de válvula de bolsa con oxígeno al 100% y compresiones torácicas. El monitor mostró fibrilación ventricular gruesa a la llegada del desfibrilador bifásico. Se administró una descarga de corriente continua con 200 J de energía. Tras la descarga, el paciente recuperó la consciencia, el pulso y la respiración espontánea. El electrocardiograma mostró un ritmo sinusal de 143 latidos por minuto, una presión arterial de 80/50 mmHg y una saturación de oxígeno del 89%.* **Conclusiones:** *Aunque las guías de reanimación cardiopulmonar ya no mencionan el golpe precordial, queda la duda de si podría ser un procedimiento inicial para salvar la vida durante la parada cardiaca en pacientes obesos.*

Palabras clave: *golpe precordial, reanimación cardiopulmonar, obesidad*

A batida precordial como uma medida de ressuscitação que salva vidas em pacientes obesos durante uma parada cardíaca fora do hospital

Resumo

Introdução: *Até recentemente, a batida precordial era reconhecida como uma medida que salvava vidas em casos de parada cardíaca com ritmo chocável confirmado e monitorado quando um desfibrilador não estava imediatamente disponível, mas não é mais mencionada nas diretrizes de ressuscitação cardiopulmonar.* **Objetivo:** *Apresentamos o trompete precordial como uma medida para salvar vidas durante a parada*

cardíaca em um paciente obeso. **Relato de caso:** *Uma equipe médica de emergência interveio em um homem de 69 anos com queixa de dor torácica que durou mais de uma hora. Ele estava dispneico, pálido e com a pele* **úmida**. *Frequência respiratória 18/min, saturação de oxigênio 89%, frequência cardíaca 76 batimentos por minuto, pressão arterial 80/50 mmHg. Eletrocardiograma: infarto do miocárdio com elevação anterior do segmento ST e bloqueio do ramo direito. O paciente era alérgico à aspirina. Ele foi tratado com 180 mg de ticagrelor oral, 500 mL de solução salina intravenosa e 4 L/min de O2 por máscara e, em seguida, entrou em parada cardíaca. Antes que o desfibrilador estivesse disponível, o paciente foi tratado com três batidas precordiais, colocação de via* **aérea orofaríngea,** *ventilação por máscara com* **válvula de bolsa** *com oxigênio a 100% e compressões torácicas. O monitor mostrou fibrilação ventricular grosseira na chegada do desfibrilador bifásico. Foi administrado um choque de corrente contínua com energia de 200 J. Após o choque, o paciente recuperou a consciência, o pulso e a respiração espontânea. O eletrocardiograma mostrou um ritmo sinusal de 143 batimentos por minuto, uma pressão arterial de 80/50 mmHg e uma saturação de oxigênio de 89%.* **Conclusões:** *Embora as diretrizes de ressuscitação cardiopulmonar não mencionem mais o trompete precordial, permanece a dúvida se ele poderia ser um procedimento inicial para salvar vidas durante a parada cardíaca em pacientes obesos.*

Palavras-chave: *batimento precordial, ressuscitação cardiopulmonar, obesidade.*

Introduction

Clinical and epidemiological evidence has linked obesity to a broad spectrum of cardiovascular diseases and sudden cardiac death [1]. In recent years, as a result of contradictory results, the effect of body mass index (BMI) on cardiac arrest (CA) survival has been the subject of debate among researchers [2]. The entire chapter of the current cardiopulmonary resuscitation (CPR) guidelines is dedicated to resuscitation procedures under special circumstances, one of which is obesity [3]. Until recently, the precordial thump (PT) was recognized as an initial life-saving CPR procedure in the guidelines for this category of patients in cases of out-of-hospital cardiac arrest (OHCA) [4]. However, in the CPR guidelines published in 2021, PT is no longer considered a lifesaving measure during CPR. Several studies have emphasized the importance of PT in confirmed and monitored shockable rhythm cases when a defibrillator is not immediately available [5]. There is insufficient evidence on the effectiveness of PT prophylaxis in unconfirmed OHCA, but it is deemed ineffective in cases of asystole and pulseless electrical activity [6]. However, a study by Madias et al. [7] recommended PT, even for asystole.

We present PT as a life-saving measure during CPR in special circumstances and for specific patients.

Case presentation

On April 6, 2022, at 4:58 PM, the emergency dispatcher received a call from a 69-year-old man complaining of sudden chest pain, intensity 9/10, spreading to both arms and the lower jaw, lasting >1 h. The pain was accompanied by nausea, and neither symptom subsided even after two nitroglycerin tablets were applied sublingually. He chronically suffered from hypertension and obesity with a BMI of 39.7 kg/m2 (body weight 130 kg, body height 181 cm). The patient was allergic to aspirin.

On arrival, the emergency medical team (EMT) found the patient lying on a bed placed against a wall. He was conscious, oriented, afebrile, dyspneic at rest, pale, and had clammy

skin. Respiratory rate (RR) 18/min, oxygen saturation ($SatO_2$) 89%, heart rate (HR) 76 bpm, blood pressure (BP) of 80/50 mmHg. Electrocardiogram (ECG) revealed sinus rhythm, heart rate (HR) around 76 bpm, ST elevation (STEMI) in D1, aVL, V1-V6 with right bundle branch block (Fig. 1).

The patient was treated with a 180 mg ticagrelor oral dose, 500 mL saline solution IV, and 4L/min oxygen by mask.

At 5:08 PM, the patient went into cardiac arrest (CA) with loss of consciousness, no pulse, and agonal breathing. Before the defibrillator arrived, the doctor performed three separate PTs (Fig. 2). After every PT, the patient would open his eyes but would lose consciousness again the next second.

The treatment involved chest compressions, application of an oropharyngeal airway, and bag valve mask ventilation with 100% oxygen. At 5:09 PM, the monitor of the biphasic defibrillator showed coarse ventricular fibrillation (VF). A DC shock of 200 J was applied. After the shock, the patient regained consciousness, pulse rate,

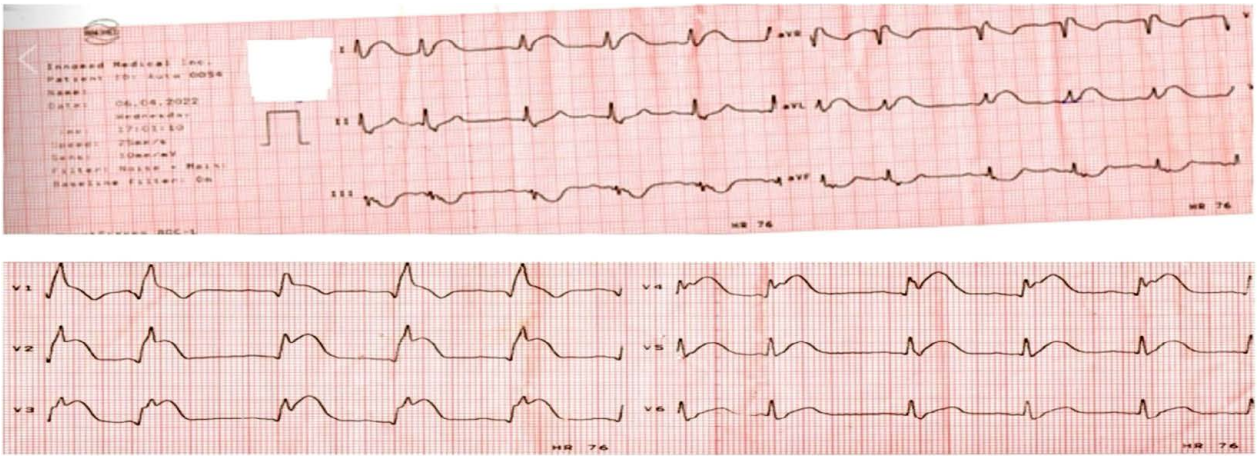

Fig. 1. ECG signs of *anterior ST elevation myocardial infarction* with right bundle branch block.

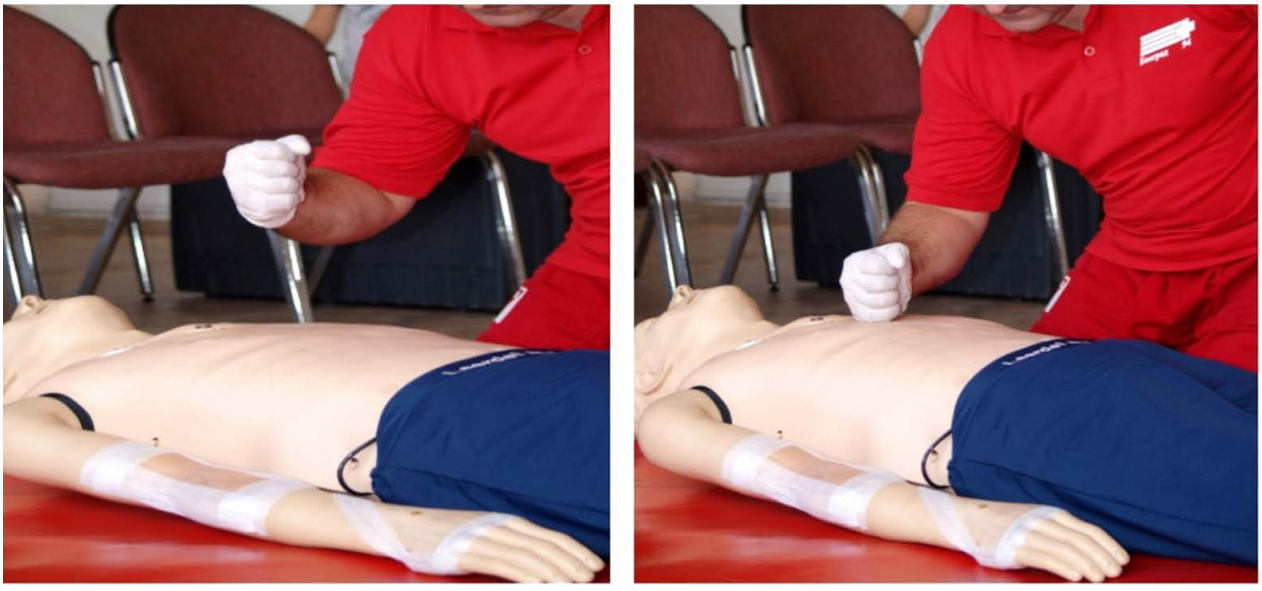

Fig. 2. The precordial thump.

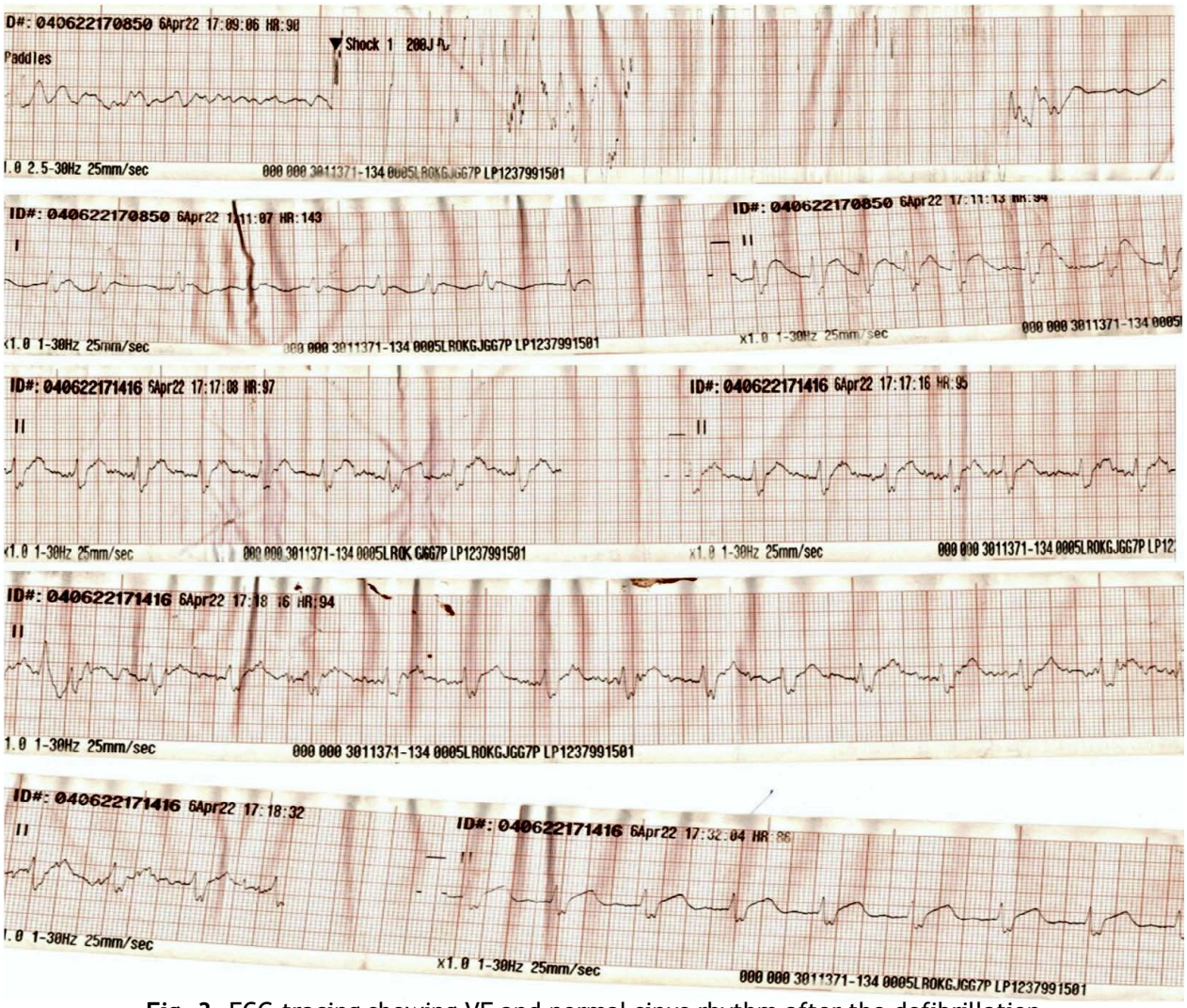

Fig. 3. ECG tracing showing VF and normal sinus rhythm after the defibrillation

and spontaneous breathing. The ECG monitor showed a sinus rhythm of approximately 143 bpm, a BP of 80/50 mmHg, and a SatO2 of 89%. Figure 3 shows the ECG tracing of the VF and normal sinus rhythm after defibrillation.

The patient attempted to remove the airway using his hand. Because of his significant BMI, the patient was transported downstairs from the second floor on a vacuum immobilization mattress by six people (a medical nurse, ambulance driver, and four neighbors). He was transported to the cath lab for percutaneous coronary intervention (PCI).

During transport, he was conscious, lightly dyspneic at rest, pale, hemodynamically decompensated, and hypotensive with signs of cardiogenic shock while maintaining a normal sinus rhythm of approximately 100 bpm. During the ensuing 10-day hospitalization, the patient experienced no more episodes of CA.

Discussion

BMI ≥ 30 kg/m2 is a surrogate marker for obesity and a risk factor for various cardiovascular diseases, including acute myocardial infarction with ST elevation (STEMI) and OHCA [8]. The

current guidelines cite the patient with obesity as a "circumstance of special patient" whose CPR does not differ from that of the normal-weight adult patient, recognizing the challenges related to the treatment of these patients without providing specific recommendations [9]. The potential benefits of PT in extremely obese patients have not yet been thoroughly studied. The results of studies looking at OHCA vary [10]. A study by Pellis et al. [11], as well as several case reports, has documented the success of PT in 25% of patients who regained circulation after CA with witnesses present, and they did not find any adverse effects from performing PT. However, Nheme et al. [12] from 2013 concluded that PT was infrequently associated with the return of spontaneous circulation (ROSC) and more frequently resulted in deterioration of the rhythm.

In previous guidelines, PT was indicated only when performed by an educated healthcare professional during the first 10 seconds after CA [13]. It is to be delivered as a strong and quick blow to the middle part of the sternum from a height of 20–30 cm with the soft (ulnar) part of a firmly clenched fist [14]. The initial energy required for the conversion of VT during the first few seconds of CA is only about 10 J [13]. Therefore, the mechanical energy generated by PT can produce sufficient electrical activity to depolarize the myocardium and establish sinus rhythm. After performing PT [6], the carotid artery pulse should immediately be palpated or the monitor screen observed. If there is no spontaneous heartbeat, a maximum of one more PT may be administered. Thus, our patient was a rarity not only for receiving a PT in a confirmed but unmonitored CA but also because he had received three individual PTs before the defibrillator had arrived.

Although guidelines offer no changes in CPR sequences for extremely obese patients, various physical and physiological factors may affect the quality of CPR [2]. It may be difficult to access the patient, transport the patient, place an IV line, and secure the airway; chest compressions may be of low quality, and vasoactive medication and defibrillation efforts may not be as effective. In the case presented, it was difficult to access the patient, who was lying on the soft surface of a bed that was placed against a wall. Although chest compressions are most effective when the patient is lying on a firm surface [15], our patient was lying on a soft surface and moving him to the floor was not possible at the time [6]. Current recommendations state that obese patients lying in bed do not necessarily need to be moved onto the floor as their heavy torso sinks into the mattress and leaves less potential for mattress displacement during chest compression [12]. There is a specific recommendation for the rescuers to change places more often, as opposed to the standard interval of 2 minutes, because it is more difficult to provide quality chest compressions to obese patients (5-6 cm deep, 100-120 bpm) [2].

Before the defibrillator became available, our patient was treated with three PTs, an oropharyngeal airway placement, bag valve mask ventilation with 100% oxygen, and the initiation of chest compressions. When the biphasic defibrillator arrived, the monitor revealed coarse fibrillation. Defibrillation protocols for obese patients should not differ from those recommended for patients with a normal BMI. Despite the opinion that the recommended energy level of 150J on a biphasic defibrillator is equally as effective on obese patients as it is on patients with a normal BMI and that there is no need to deliver higher energy levels through defibrillation [6], the optimal amount of energy for obese patients has not yet been defined. In our case, a DC shock of 200 J was delivered. Transporting an extremely obese patient can be very difficult [11]. Our patient was carried down from the second floor into the ambulance by six people on a vacuum immobilization mattress while being monitored the entire time. Even though specialized ambulances modified to

transport extremely obese patients, equipped with reinforced stretchers and specialized lifting gear, do exist, our EMT does not have them. The hospital confirmed the diagnosis of STEMI and a stent was placed. During the ensuing 10-day hospitalization, the patient experienced no more episodes of CA.

Conclusion

The available evidence on the benefits and drawbacks of applying the PT in CA is inconsistent. If a PT can save even one life in prehospital settings on a confirmed, but unmonitored CA, as it did in our case report, it deserves further evaluation on a grander scale, on more patients with various BMIs (normal or elevated), various initial rhythms, and in various countries (both developed and underdeveloped).

Availability of data and materials

The data presented in this study are available on reasonable request from the corresponding author.

Author contributions

MM was taking care of the patient, diagnosed the case, and was the main initiator of the manuscript. IM collected the material about the patient and wrote the first version of the manuscript. SA - revised the drafted work and contributed to the analysis and interpretation of clinical data. All authors have read and agreed to the published version of the manuscript.

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