

# Cardiac arrest as a result of ventricular tachycardia in a trauma patient

Ganiyu A. Rahman, FWACS, FICS, Abdullah H. Al Haizaey, MBBS, SBGS, Abdelaziz D. Al-Soudi, MBBS.

## ABSTRACT

يمكن تصنيف توقف القلب على أساس إمكانية علاجه بمزيل الرجفان البطيني أو عدم ذلك، حيث يعتمد ذلك على طبيعة إيقاف حركة القلب التي يمكن أن تكون قابلة للصدمة (الرجفان البطيني والتسارع البطيني عديم النبض)، أو حركة القلب الغير قابلة للصدمة (توقف الانقباض والنشاط الكهربائي عديم النبض). نستعرض في هذا المقال حالة مريض ذكر سعودي يبلغ من العمر 72 عاماً، ولم يكن هذا المريض يعاني من أي مرض قبل إصابته بحادث مروري في الطريق. لقد تم تقييم حالته عند وصوله للمستشفى على أنها حالة وفاة من جراء الإصابة الرضحية. ولاحقاً اكتشف الأطباء أنه كان يعاني من تسارع نبضات القلب قبل حصول الحادث، وعلى ضوء ذلك تم إنعاش قلبه بنجاح وتسريحه من المستشفى بعد مرور 8 أيام.

Cardiac arrest is classified based on whether it is treatable using defibrillation or not. It is classified as shockable rhythm (ventricular fibrillation and pulseless ventricular tachycardia), or non-shockable (asystole and pulseless electrical activity). We present a case of a 72-year-old male Saudi patient not known to have any medical illness that was involved in a road traffic accident. He was brought in dead on arrival, and initially managed as a case of trauma, only to discover later that he had ventricular tachycardia just before the trauma. He was successfully resuscitated and discharged after 8 days.

*Saudi Med J 2011; Vol. 32 (5): 525-527*

*From the Department of Surgery (Rahman), College of Medicine, King Khalid University, and the Department of Surgery (Rahman, Al Haizaey, Al-Soudi), Asir Central Hospital, Abha, Kingdom of Saudi Arabia.*

*Received 11th December 2010. Accepted 28th February 2011.*

*Address correspondence and reprint request to: Dr. Ganiyu A. Rahman, Department of Surgery, College of Medicine, King Khalid University, PO Box 641, Abha, Kingdom of Saudi Arabia. Tel. +966 530038640. E-mail: garahman1@yahoo.com*

of failure of contraction of the heart muscle.<sup>1</sup> It can be caused by cardiac and non-cardiac diseases. The causes of non-cardiac sudden death include trauma, non-traumatic bleeding, intoxication, near drowning, and pulmonary embolism. In this case, we present a patient seen in the emergency room (ER) as a result of a road traffic accident. Trauma was thought to be the cause, but there was an undiagnosed cardiac lesion. He survived after intensive and persistent resuscitation. The aim of this presentation is to serve as reminder to members of the trauma team that even in trauma patients, a cardiac cause of sudden CA should be borne in mind, and further emphasize the importance of 'chain of survival' in cardiopulmonary resuscitation (CPR).

**Case Report.** We present a 72-year-old male Saudi patient not known to have any medical illness, who was brought to the ER by his family with CA after he was involved in a road traffic accident. He was a passenger in a car that rolled over, and was found in the back seat of his car. On arrival in ER, the patient had no palpable pulse with agonal respiration, and his blood pressure (BP) was not recordable. The Glasgow coma score was 3. Cardiac arrest call team and trauma team were immediately available for resuscitation. The patient was immediately intubated, and a cervical collar was applied. There was equal air entry bilaterally but no heart sound. Chest compression was conducted with the administration of boluses of intravenous Ringer's lactate (500 ml x2), and an intravenous push of one mg epinephrine. After 15 minutes, the electrocardiography (ECG) showed ventricular tachycardia (VT) (Figure 1). During resuscitation, a short history was obtained from the patient's son. He said his father complained of chest pain and shortness of breath at home, and they were bringing him to the hospital based on his complaint when the road traffic accident happened.

The CA medical team was immediately summoned to continue resuscitation with the trauma team. The patient had 2 cycles of direct current shock of 200 and 360 joules monophasic energy. When the patient was

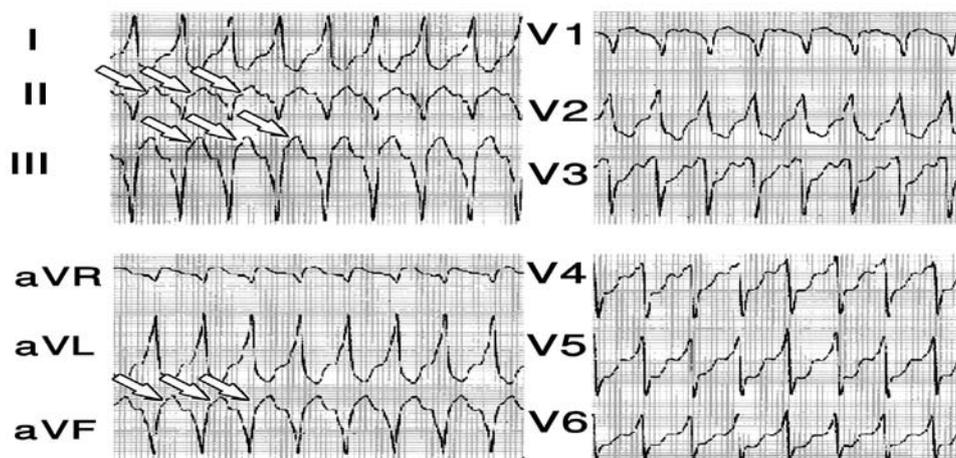
The term dead on arrival is used when in the presence of a professional medical assistance, a patient is found clinically dead, whereas, cardiac arrest (CA) means stoppage of normal circulation as a result

re-evaluated, the endotracheal tube was found to be in place, and there was equal air entry with paradoxical chest movement, probably from rib fractures as a result of aggressive chest compression. The patient's BP was 118/82 mm Hg, his pulse was 109/min, and oxygen saturation was 94% on oxygen. There was no inotropes required. Abdominal examination revealed a non-distended, soft, and lax abdomen. There was no tenderness, and the pelvis was stable. Logrolling was performed, and no obvious abnormality was found, and the normal digital rectal examination was without bleeding or high-riding prostate. Pelvic x-ray was normal. The patient's chest x-ray is shown in **Figure 2**.

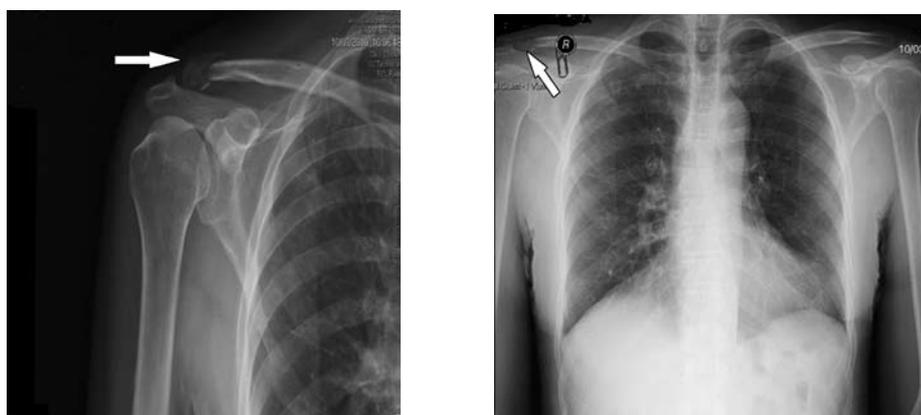
After a thorough discussion with the Cardiology Team, the patient was taken to the computerized tomography (CT) room. The brain and cervical CT showed atrophic brain, small bilateral frontal subdural hematoma, and the chest CT showed costochondral fracture, normal mediastinum, and pericardium. The CT of the abdomen was normal (no abnormality detected). Cardiac catheterization was not carried out since the

cardiologist did not consider it necessary. The chest CT and ECG did not show any evidence of blunt cardiac injury. The patient was then shifted to the Coronary Care Unit as combined admission with all trauma team and cardiology team. The transthoracic ECG showed focal hypokinesia, ejection fraction 10-15%. The patient was doing satisfactorily and was extubated on the third day, and then discharged on the eighth day with cardiac medication, such as acetylsalicylic acid, simvastatin, and Frusemide.

**Discussion.** Cardiac arrest is failure of the heart to contract effectively, leading to stoppage of normal circulation of blood.<sup>1</sup> When the arrest is sudden and leads to death, it is known as sudden cardiac death.<sup>2</sup> The CA, which is synonymous with clinical death is diagnosed when there is cessation of blood circulation and breathing.<sup>1</sup> In Western countries, sudden cardiac death accounts for 15% of death.<sup>3</sup> Cardiac arrest is classified based on whether it is treatable using defibrillation, or not.<sup>4</sup> It is classified as shockable rhythm (ventricular



**Figure 1** - Electrocardiography showing ventricular tachycardia. aVR - augmented vector right, aVL - augmented vector left, aVF - augmented vector foot



**Figure 2** - Chest x-ray showing fractured right clavicle.

fibrillation [VF] and pulseless VT), or non-shockable (asystole and pulseless electrical activity). The patient presented had VF, hence the favorable response to defibrillation. The mainstay of treatment of sudden CA is CPR. The concept of 'chain of survival' describes the successful outcome of resuscitation. These include: early recognition, early CPR, early defibrillation, and early advanced care. In the patient presented, this concept of chain of survival was initiated, and maintained by the CA team. If one or more links in the chain are missing or delayed, then chances of survival drop significantly. It is known that there is an association between the mechanisms of sudden cardiac arrest (SCA), and the outcome of initial resuscitation. Studies have shown that when the initial rhythm is asystole, the likelihood of successful resuscitation is low. Only 10% of patients with out-of-hospital arrests and initial asystole survive until hospital admission, and only 0-2% until discharge.<sup>5</sup> This may be the result of prolonged duration of CA and irreversible myocardial damage.

Patients with pulseless electrical activity (PEA) also have poor outcome.<sup>6</sup> However, patients with ventricular tachyarrhythmia have better outcome. The most frequent etiology is VF. Approximately 25-40% of patients with SCA caused by VF survive until hospital discharge.<sup>7</sup> Though as many as one-third of cases of SCA are due to non-cardiac causes,<sup>7</sup> the outcome is not encouraging. In one series, 40% of such patients were successfully resuscitated and hospitalized, however, only 11% were discharged from the hospital, and only 6% were neurologically intact, or had mild disability.<sup>8</sup> The patient presented had an unknown cardiac cause. He survived and was discharged from the hospital with no neurological impairment.

This presentation further emphasizes the need to persist in CPR as reported in a similar situation by Gallucio et al<sup>9</sup> recently, and the need for combined team care despite the poor outcome in out-of-hospital SCA. Survival in VF is dependent on the prompt delivery of effective CPR. Electrical defibrillation is the only way to re-establish organized electrical activity and myocardial contraction. This is clearly manifested in the management of the patient presented. Though in this patient, resuscitation continued for 43 minutes, the patient had defibrillation early in the resuscitation. Defibrillation alone often results in successful resuscitation if delivered within 4 minutes of CA. This further confirms the lesson to be learnt from the management of this patient. Based on the experience in the management of this patient, we recommend that in blunt trauma patients presenting with CA, there should be a systematic evaluation to exclude reversible causes. This can be achieved with detailed clinical evaluation, chest x-ray, focused assessment sonography for trauma

(FAST) and ECG. These can be adjunct to primary survey.

The decision to resuscitate or not to resuscitate, to continue, or to stop resuscitation may be much easier in patients with much tissue destruction, and those with penetrating chest injury, but this is not the case in patients with blunt trauma. This is because in patients with blunt trauma there is always a chance that the arrest may be due to a medical cause, as in the case presented. In patients with penetrating chest injury with CA, it is an indication for immediate thoracotomy. Survival from traumatic CA is poor with survival rates of 0-3.7% reported,<sup>10</sup> and some consider resuscitation of this patient group futile. In a recent study by Lockey et al,<sup>10</sup> they concluded that though survival rates in patients with traumatic CA are poor, they are comparable with (or better than) published survival rates for out-of-hospital CA of any cause. We, therefore, agree with Lockey et al<sup>10</sup> that adherence to recently published guidelines may result in withholding resuscitation in a small number of patients who have a better chance of survival.<sup>10</sup>

In conclusion, even in trauma patients, cardiac cause should also be considered and aggressive resuscitation can always be rewarding.

## References

1. Myerburg RJ, Castellanos A. Cardiovascular Collapse, Cardiac arrest and Sudden Death. In: Kasper DL, Fauci AS, Longo DL, Braunwald E, Jameson JL, Loscalzo J, eds. *Harrison's Principles of Internal Medicine*. 17th ed. New York (NY): McGraw-Hill; 2008. p. 1707-1708.
2. Zheng ZJ, Croft JB, Giles WH, Mensah GA. Sudden cardiac death in the United States, 1989 to 1998. *Circulation* 2001; 104: 2158-2163.
3. Mutchner L. The ABCs of CPR--again. *Am J Nurs* 2007; 107: 60-69.
4. Resuscitation Council (UK) Guideline 2005. [updated 18 October 2010. accessed 12, March, 2011] Available from URL: <http://www.resus.org.uk/pages/gl05arch.htm>
5. Engdahl J, Bang A, Lindqvist J, Herlitz J. Can we define patients who with no and those with some chance of survival when found in asystole out of hospital? *Am J Cardiol* 2000; 86: 610.
6. Levine RL, Wayne MA, Miller CC. End-tidal carbon dioxide and outcome of out-of-hospital cardiac arrest. *N Eng J Med* 1997; 337: 301.
7. Rea TD, Eisenberg MS, Becker LJ, Murray LJ, Hearne T. Temporal trends in sudden cardiac arrest: a 25-year emergency medical services perspective. *Circulation* 2003; 107: 2780.
8. Kuisma M, Alaspaa A. Out-of-hospital cardiac arrest of non-cardiac origin. Epidemiology and outcome. *Eur Heart J* 1997; 18: 1122.
9. Gallucio ST, Flabouris A, Griggs WM. Resuscitation from prolonged cardiac arrest in a blunt trauma patient: seeking guidance through the guidelines. *Injury* 2008; 39: 805-808.
10. Lockey D, Crewdson K, Davies G. Traumatic cardiac arrest: who are the survivors? *Ann Emerg Med* 2006; 48: 240-244.