Resuscitation (2007) **73**, 475—484

ELSEVIER

RESUSCITATION

www.elsevier.com/locate/resuscitation

CASE REPORT

Out-of-hospital cardiac arrest from air embolism during sexual intercourse: Case report and review of the literature☆

Anatolij Truhlar[a,b,*], Vladimir Cerny[b], Pavel Dostal[b], Miroslav Solar[c], Renata Parizkova[b], Iva Hruba[c], Ladislav Zabka[a]

[a] *Helicopter Emergency Medical Service ''Christoph 6'' Hradec Kralove, Hradec Kralove Region Emergency Medical Services, Czech Republic*
[b] *Department of Anaesthesiology and Intensive Care Medicine, Charles University Prague, Faculty of Medicine Hradec Kralove, University Hospital Hradec Kralove, Czech Republic*
[c] *Department of Internal Medicine, Charles University Prague, Faculty of Medicine Hradec Kralove, University Hospital Hradec Kralove, Czech Republic*

Received 29 April 2006; received in revised form 28 September 2006; accepted 11 October 2006

KEYWORDS
Air embolism;
Sexual intercourse;
Cardiac arrest;
Cardiopulmonary resuscitation (CPR);
Out-of-hospital CPR;
Emergency medical services

Summary We report the successful resuscitation of a 38-year-old woman in cardiac arrest following heterosexual intercourse 7 days after spontaneous abortion and an instrumental uterine evacuation. The collapse was thought to be due to venous air embolism (VAE). Her survival neurologically intact was attributed to appropriate first aid, pre-hospital and subsequent hospital intensive care. Neither a case of an out-of-hospital air embolism where the patient made a good recovery, nor a case of miscarriage followed by collapse from air embolism has been reported in the literature. Air embolism is a very infrequent cause of out-of-hospital cardiac arrest with a high mortality rate. Predominant causal reasons are severe penetrating neck or thoracic injuries and sexual activities in pregnancy, when air can pass into the damaged veins in the wall of the uterus and lead to total obstruction in the heart. Diagnostics and management techniques for venous air embolism are discussed. Air embolism should be included in the differential diagnosis for all young women in cardiac arrest, particularly when occuring during sexual activity. Instructions in risks of sexual intercourse during pregnancy and the puerperium should become part of pregnant women's education.

Abbreviations: CPC, cerebral performance category; ECG, electrocardiogram; EMS, emergency medical service; GPS, global positioning system; ICU, intensive care unit; ROSC, return of spontaneous circulation; VAE, venous air embolism

☆ A Spanish translated version of the summary of this article appears as Appendix in the final online version at 10.1016/j.resuscitation.2006.10.004.

* Present address: Helicopter Emergency Medical Service ''Christoph 6'' Hradec Kralove, Hradec Kralove Region Emergency Medical Services, Hradecka 1690/2A, 500 12 Hradec Kralove 12, Czech Republic. Tel.: +420 604 967 417.
E-mail address: ATruhlar@seznam.cz (A. Truhlar).

0300-9572/$ — see front matter © 2006 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.resuscitation.2006.10.004

Introduction

Life threatening air embolism has become important in anaesthesiology and intensive care medicine as invasive intravascular procedures have become widespread. Cardiovascular, thoracic, neurological and obstetric surgeries have also increased amount of documented venous air embolisms (VAE). In order to develop VAE, there must be communication between the vascular lumen and the source of air as well as a pressure gradient favouring input of the air into the vessel. Air embolism can occur during any surgical procedure where there is low venous pressure in the surgical field, especially when elevated above the level of the heart. Neurosurgical and head and neck surgery performed on patients in the sitting position are the most common clinical situations. Within obstetrics, minor VAE occurs very frequently during cesarean delivery. In the intensive care unit (ICU), air embolism is most likely to be encountered during or after insertion of a central venous catheter. The air may enter the great veins directly after the needle is inserted if the hub is not occluded.[1–4]

The clinical manifestation varies in both severity and organs affected. The signs are not specific and mostly include tachypnea, cyanosis, tachycardia, arrhythmias, hypotension and chest pain. The most severe cases can lead to unconsciousness and cardiopulmonary arrest. In humans, the fatal dose of air is uncertain, but estimated to be between 300 and 600 ml if administered in a single, rapid injection (100 ml/s). The volume required to cause death decreases as the rate of air entry increases. [1,2]

In the out-of-hospital setting, VAE is a very infrequent cause of cardiac arrest with a high mortality rate as therapeutical possibilities are very limited compared with in-hospital cases. Predominating causal reasons are severe penetrating neck or thoracic injuries and sexual activities in pregnancy when air bubbles can pass through the impaired wall of the uterus and lead to blood flow obstruction under certain circumstances.[1,5,6] The vagina is a highly distensible organ, especially in pregnancy, and has an immediate postpartum capacity up to 2000 ml.[7,8] It can easily contain a fatal amount of air under increasing pressure sufficient to dissect through the cervical canal and reach the venous drainage of the uterus. Some risk remains for 6 weeks after childbirth while the uterus is returning to normal and the placental site is healing.

We report a successful cardiopulmonary resuscitation (CPR) of a young woman in a full cardiac arrest following sexual intercourse where the collapse was thought to be due to VAE. Neither a case of out-of-hospital VAE where the patient made a good recovery nor a case of miscarriage followed by collapse from air embolism has been reported in the literature.

Figure 1 An emergency response vehicle (Mercedes-Benz 316 CDI Sprinter, Germany) and its medical equipment used in the town of Hradec Kralove (Czech Republic). Photo: A. Truhlar, MD.

Case report

In August 13th, 2005, a 38-year-old woman was engaged in sexual intercourse with her husband in a rear entry position. While the act was still in progress, the young woman unexpectedly developed unconsciousness, gasped and collapsed down on the bed. Seven days before she had undergone an evacuation of retained products of conception (ERPOC) after spontaneous abortion in the 12th week of gestation in the University hospital. It was her third pregnancy after she had given birth to two healthy children. Although the gynaecologist advised her of the risk of sexual activities after the surgical procedure, the advice was not respected.

An emergency call from the husband was received in the regional emergency medical dispatch centre in the town of Hradec Kralove at 1:49:08 a.m. ($T = 0$). The national emergency telephone number for ambulance service (155) was used. An emergency physician, a paramedic and a driver staffed the mobile intensive care unit (Figure 1), which was alerted at 1:51:10 a.m. (T + 2 min 2 s) and left its base immediately. After an emergency response vehicle was dispatched to the scene, the EMS dispatcher provided the husband with telephone-assisted CPR and stayed on the line until the ambulance arrived. The ambulance stopped at 1:58:57 a.m. (T + 9 min 49 s) and EMS personnel got to the patient's side in the third floor at 2:01:06 a.m. (T + 11 min 58 s).