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Visual Case Discussion

LUCAS® leaving its footprints during cardiopulmonary resuscitation

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1. Visual case discussion

Hours after successful percutaneous coronary intervention in acute myocardial infarction, a 75-year-old patient suffers hemodynamically relevant retroperitoneal bleeding from the puncture site in the right femoral artery. The patient is transferred to the surgical center for emergency inguinal revision, where he arrives in severe hemorrhagic shock. Though immediate volume substitution according to the local massive transfusion protocol and under high-dose catecholaminergic therapy, the hemodynamic situation worsens and the patient presents pulseless electric activity.

Immediately, cardiopulmonary resuscitation (CPR) is initiated according to the advanced life support algorithm.[1] With a potentially reversible cause of cardiac arrest, a mechanical chest compression device (LUCAS® 2, Physio-Control/Stryker, Kalamanzoo/USA) is applied while surgery is proceeded in order to control bleeding.

Mechanical chest compression devices deliver high quality chest compressions at a constant rate and though may improve the resuscitation process in distinct situations and under clear therapeutic concepts.[2,3] Like manual chest compressions, mechanical CPR devices may cause traumata including superficial lesions, fractures, or ruptures leading to pneumothorax, hemothorax, or intraabdominal bleeding. After chest compressions in cardiopulmonary resuscitation, these injuries should actively be sought, or excluded. The skin lesion shown in the photograph is characteristic for the system applied in our case.

Characteristic superficial lesion caused by the piston of a mechanical chest compression device.

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Questions

1. During cardiopulmonary resuscitation (CPR) in adults, chest compressions:
   a. should be at least 5 but not more than 6 cm in depth
   b. are performed at a rate of 100–120 per minute
   c. should be interrupted for any simultaneous procedure
   d. alternate with ventilations at a ratio of 5:1
   e. should allow the chest to recoil

2. Mechanical (automated) chest compression devices:
   a. should be attached before defibrillation
   b. may perform high-quality chest compressions
   c. may reduce interruptions of compressions
   d. may cause relevant injuries
   e. are associated with higher survival rates

Answers

1. a. = true; b. = true; c. = false; d. = false; e. = true. According to current advanced life support guidelines, chest compressions should be of high quality, which is essential to improve the patients' outcomes. Chest compressions should be "of adequate depth", precisely in adults at least 5 but not more than 6 cm, allowing the chest to recoil after each compression, and at a rate of 100–120 compressions per minute. Any interruptions in compressions should be minimized. Chest compressions are alternated with rescue breaths or ventilations at a ratio of 30:2.
2. a. = false; b. = true; c. = true; d. = true; e. = false. Unlike manual (conventional) chest compressions, mechanical CPR devices do not show fatigue, though being considered to deliver high quality chest compressions at a constant rate. However, these devices should be applied with a rationale and must not delay life-saving therapeutic measures. Mechanical chest compressions may cause traumata like the characteristic skin lesions introduced in our image, but also thoracic, liver, or spleen trauma, for example. Concerning the patients' long-term outcomes, mechanical CPR devices failed to proof superiority over manual chest compressions in randomized controlled trials.

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Declaration of Competing Interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.visj.2019.100666.

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