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Case Report

Cardiac arrest after tourniquet deflation in upper limb

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ABSTRACT

Pneumatic tourniquet is a technique widely used in orthopedic surgery, in particular, for reducing intraoperative bleeding and facilitation of surgery. That said, it may cause local and systemic complications which can be life-threatening. The description of this kind of complications is usually made after lower limb utilization. We report the case of a patient, operated for fractures of the two upper limbs, who presented after the second tourniquet deflation, a cardiac arrest with a good recovery after cardio-pulmonary resuscitation. The most likely cause of this cardiac arrest, is the ischemia reperfusion syndrome caused by successive excessively inflated tourniquet, since pulmonary embolism and myocardial infarction are eliminated. In the light of this exceptional clinical observation, we insist on the respect of usual recommendations of use, such as duration and inflation pressure, especially when successive upper limbs tourniquets are used.

Pneumatic tourniquet is widely used in orthopedic surgery, especially for reducing intraoperative bleeding and facilitation of surgery. That said it may cause local and systemic complications which can be life-threatening. The description of complications is usually made after lower limb utilization. We report the case of a patient, operated for the two upper limbs fractures, who presented after the second tourniquet deflation, a cardiac arrest with a good recovery after cardio-pulmonary resuscitation. A 35 years old patient, with no particular medical history, admitted to the emergency room for both upper limbs trauma after motorcycle crash. Radiological assessment showed a complex right elbow fracture associated with left both bone forearm fractures. Otherwise, no traumatic lesion was found. 3 days after admission, surgery was performed under general anesthesia, in a stable patient. Induction was achieved by 300 μg of Fentanyl, 3 mg Midazolam, 200 mg Propofol and 40 mg of Rocuronium and the maintenance provided by isoflurane and fentanyl/Rocuronium reinjections. Surgical act was conducted in two phases. A first fixation of the left forearm fractures, under tourniquet inflated to 350 mm Hg on demand of operating surgeon, released after 1 h 35 min. At this moment, a hypotension, assigned to position change, was observed and corrected by saline vascular filling associated with ephedrine IV bolus. The second time was a surgical fixation of the elbow fracture with a tourniquet inflated to 350 mm Hg for 1 h 45 min. A liter of saline loading associated with ephedrine and phenylephrine bolus were administered during the last hour of intervention to maintain a correct arterial pressure. 5 min after the second tourniquet deflation, the patient presented a deep hypocapnia concomitant with an extreme hypotension followed by a severe bradycardia preceding the occurrence of asystole. Cardiopulmonary resuscitation allowed after 7 min the recovery of spontaneous circulation. In parallel a transthoracic echocardiography has shown a mild RV dilatation associated with a moderate impairment of left ventricular systolic function with

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no segmental hypokinesis. Blood gas shows a metabolic acidosis at 7.16 associated with a hyperkaliemia at 5.7 mmol/l and a hyperlactatemia at 3.6 mmol/l. The patient became more stable under continuous epinephrine and was transferred to ICU, where 24 h of mild therapeutic hypothermia was realized. Cardiac troponin I, was slightly elevated at 0.1 μg/l controlled at 0.03 μg/l. CT pulmonary angiogram has not shown any proximal emboli. 3 days later, weaning of epinephrine was carried out, and the patient was discharged home on postoperative day 10, with normalization of the echocardiogram. The occurrence of cardiac arrest after tourniquet deflation is a rare complication described mostly in surgery of the lower limb [1,2]. Our literature review noted a single observation of a cardiac arrest, after deflation of upper limb tourniquet, related to a coronary spasm [3]. That's said, in our observation the mechanism of cardiac arrest is not clear. But, according to available data, the most likely cause is the ischemia reperfusion syndrome caused by successive, excessively inflated tourniquet, since pulmonary embolism and myocardial infarction are eliminated [4]. In fact, the tourniquet inflation leads to ischemia of the limb with metabolic changes like decrease of PaO_2 and pH and accumulation of lactic acid, carbon dioxide, potassium, and toxic metabolites. With the cuff deflation, these products are released in the blood circulation with systemic damaging effects, and may lead in some extreme cases to cardiac arrest. In this rare clinical observation, additive effects of the two tourniquets, inflated with a particularly excessive pressure, have led to a severe ischemia reperfusion syndrome despite the small muscular mass of each upper limb. The favorable evolution with normalization of the echocardiogram is suggestive of a myocardial stunning which is quite common in this context of ischemia reperfusion injury [5]. Thus, and in the light of this observation, we insist on the respect of usual recommendations of use, such as duration and inflation pressure. Otherwise, we cannot recommend to avoid, the use successive upper limbs tourniquets, based only on this single case of a rare complication.

Conflict of interest

None.

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