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International Commission for Alpine Rescue

Commission for Mountain Emergency Medicine

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Small Volume Therapy in Mountain Rescue

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For Mountain Emergency Physicians

Introduction

Volume therapy in trauma patients in the mountain environment entails several problems that have to be taken into account properly to be of benefit for the patient. Hypothermia is present in nearly every trauma patient in the mountains irrespective of the season. Large amounts of cold iv-solutions precipitate a drop of core temperature. Due to cold ambient temperature, restricted and time consuming access to IV sites, and difficult rescue maneuvers/ transportation in rough terrain, the application and management of iv-lines in a rescue situation must be handled differently than in the normal setting.

Therefore, small volume resuscitation (SVR) with hypertonic solutions might be especially favorable for volume therapy in the mountain setting because of:

1. Low volume and weight
2. Can be kept warm more easily
3. Very short time of administration (3-5 minutes)
4. Highly effective within minutes

Indications

Traumatic/hemorrhagic/hypovolemic shock, especially in combination with severe brain injury

No contraindications in the prehospital emergency setting

Procedure

1. Introduce and secure one large bore iv catheter
2. Administer body warm hypertonic solution as rapid bolus in 3-5 minutes
3. Evaluate effect on blood pressure, heart rate and peripheral microcirculation
4. Maximum dosage of hypertonic solutions for adults: 4 mL/kg body weight
5. Continue with standard isotonic cristalloid or colloid solutions.

Do not:

1. Administer large amounts of cold solutions (hypothermia!)
2. Continue infusion during transportation through rough terrain (Uncontrolled, disconnection of line, venous air embolism)
3. Waste time with overaction (e.g. more than two iv-lines)
4. Overload with volume in case of uncontrolled bleeding

Small volume resuscitation in haemorrhagic shock, the essentials:

A small volume of a hypertonic/hyperoncotic solution restores hemodynamic stability and improves microcirculation due to a rapid mobilisation of fluid from erythrocytes, vascular endothelium, and the interstitial space.

1. Transient osmotic translocation of extracellular and intracellular water into the vascular compartment
2. Prolonged increase in venous return
3. Peripheral vasodilation
4. Decrease of ischemia induced adhesion of leucocytes on vascular endothelium
5. Reduction of endothelial cell edema, optimizing of flow properties of blood with improvement of capillary perfusion
6. Redistribution of regional blood flow
7. Improvement in myocardial contractility

SVR is highly effective when administered rapidly within 3-5 minutes. Despite the high osmolarity of ~2400 mosmol/l peripheral iv administration is well tolerated. Because of the temporary effect (30 min) of the hypertonic solution volume therapy should be continued with isotonic crystalloid and colloid solutions when necessary.

References:

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