ICAR MEDCOM

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ICAR MEDCOM RECOMMENDATION

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Title	Suspension syndrome
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1. Background

Suspension syndrome (also called suspension trauma or harness hang syncope) describes a potentially life-threatening event induced by passive hanging on a rope or in a harness system in a vertical or near-vertical position.[1-4]

Although numerous cases are reported, the exact incidence of the suspension syndrome is not known.[1,5-9] Since the first case series of the suspension syndrome was presented in 1972,[3] its pathophysiology has been debated controversially.[4,10] A widespread hypothesis assumes blood pooling in the lower limbs, prompting a reduction in cardiac preload and subsequently a decrease in cardiac output and tissue perfusion, eventually leading to loss of consciousness and cardiac arrest.[10] However, no study has proved this hypothesis.

The immediate aid by first responders is still debated and some recommendations advise against placing a casualty in a supine position after being rescued from suspension, hypothesizing an acute right ventricular volume overload due to the blood returning from the legs.[3,5,11] This hypothesis has never been proven and is based on 'expert opinion' only.

Recently, an experimental study brought new insight into the pathophysiology of the suspension syndrome[12] and gave reason to release this recommendation. Venous pooling was demonstrated; however, it did not substantially reduce cardiac preload. Instead, a neurocardiogenic reflex with a sudden reduction in heart rate and blood pressure caused near-syncope in 30% of the subjects. The time to near-syncope was variable and unpredictable (13-60 minutes). Though the exact mechanism triggering the neurocardiogenic response is not clear, venous pooling is thought to play an important role.[13] Ultrasound showed that leg movement reduced venous pooling and might therefore prevent or at least delay the suspension syndrome.[12] In the study, all participants (also those who experienced a near-syncope) were brought into a supine position immediately after the hanging phase. With the help of echo-

cardiography, an acute cardiac volume overload was excluded, contradicting the recommendation to place victims in a semi-recumbent position first.

These recommendations are based on an unanimous consensus opinion of ICAR Medcom. Unusually we are publishing these before a definitive peer reviewed article will be published. We feel this deviation from our normal practice is important for the safety of patients

2. Recommendations

Nr.	Recommendation	Grade
1	We suggest the following classification of suspension syndrome: 1. Acute suspension syndrome a) Near suspension syncope (characterized by light-headedness, pale skin, warmth, blurred vision or nausea)[12,14] b) Suspension syncope[12,14] c) Suspension cardiac arrest (after exclusion of other causes of cardiac arrest, e.g. myocardial ischaemia, trauma, hypothermia)[4,15] d) Post-suspension cardiac arrest within 60 min after rescue[4] 2. Subacute a) Sensory or motoric deficit in the legs persisting for >24 hours after rescue[4] b) End organ dysfunction, in particular rhabdomyolysis-associated acute kidney injury[4,9] c) Cardiac arrest >60 min after rescue[4]	2C
2	Rope work should never be conducted alone.	1A
3	Persons suspended in a harness should be rescued as soon as possible, even if the casualty is asymptomatic, as time to near or actual syncope and cardiac arrest is variable and unpredictable.[12]	1A
4	While awaiting rescue, persons suspended freely on a rope should move their legs in order to reduce venous pooling.[12]	2B

5	If no adjoining structures are in reach, foot loops should be used to step in and increase the activation of the muscle pump.[1,4,12,15]	2B
6	If the casualty is no longer able to act and it is safe to do so, the first rescuer reaching the casualty should raise the victim's legs to create a more horizontal position while measures are taken to lower the patient to the ground.[12,15]	2C
7	Once the casualty is on the ground, the casualty should be positioned supine. Assessment and treatment should follow standard advanced life support algorithms. Reversible causes of cardiac arrest, including hyperkalaemia and pulmonary embolism, should be considered and managed appropriately.[1 4,12,16-18]	1A
8	After prolonged hanging (>2 hours), monitoring of serum potassium and creatine kinase should be established and renal replacement therapy considered in patients with acute kidney injury.[3,4]	2C

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The Grading System of the American College of Chest Physicians

Grade	Description	Benefits vs risks and burdens	Methodological quality of supporting evidence
1A	Strong recommendation, high-quality evidence	Benefits clearly outweigh risks and burdens or vice versa	RCTs without important limitations or overwhelming evidence from observational studies
1B	Strong recommendation, moderate-quality evidence	Benefits clearly outweigh risks and burdens or vice versa	RCTs with important limitations or exceptionally strong evidence from observational studies
1C	Strong recommendation, low-quality or very low-quality evidence	Benefits clearly outweigh risks and burdens or vice versa	Observational studies or case series
2A	Weak recommendation, high-quality evidence	Benefits closely balanced with risks and burdens	RCTs without important limitations or overwhelming evidence from observational studies
2B	Weak recommendation, moderate-quality evidence	Benefits closely balanced with risks and burdens	RCTs with important limitations or exceptionally strong evidence from observational studies
2C	Weak recommendation, low-quality or very low-quality evidence	Uncertainty in the estimates of benefits, risks, and burden; benefits, risk, and burden may be closely balanced	Observational studies or case series

American College of Chest Physicians classification scheme for grading evidence and recommendations in clinical guidelines. RCT, randomized controlled trial.

Source: Guyatt et al. Chest 2006;129:174-81.