G70 Harness Hang Syndrome and a Death While Rappelling

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The goal of this presentation is to review the nature and effects of suspension by a harness and to discuss a death that occurred under such conditions. Attendees should gain a better appreciation of the potential hazards of prolonged harness suspension. The goal is to inspire others to do further research on the topic.

This presentation will impact the forensic science community by introducing the unusual topic of harness hang, also known as suspension stress or suspension trauma. The impact of the presentation will be a better understanding of the possible mechanisms and nature of deaths occurring under the condition of harness suspension. This experience may be helpful in future investigations of similar cases.

Rock climbing is a popular outdoor activity that may involve suspending oneself within a harness while climbing or descending. Harnesses as a component of a personal fall protection system are used in other recreational and industrial activities. The hazards of falls are obvious, but less well known are the possible hazards of prolonged harness suspension. The harness hang syndrome, also known as suspension stress or suspension trauma, is the result of the physiological response to a motionless body being suspended in a vertical position for a period of time. It is believed that this can lead to cardiovascular alterations, loss of consciousness and even death. Although the medical and forensic literature has little on this subject, other types of suspension and asphyxial deaths are well-known. The most common type of suspension death, of course, is hanging. But other types of asphyxial deaths may involve suspended or trapped body positions such as traumatic or positional asphyxia. The death of a young male who was rappelling down a rock face in close proximity to a waterfall is presented.

This 24-year-old man was found suspended in his rock-climbing harness along the rock wall of Mildred Falls in the Cleveland National Forest on evening of February 11, 2011. A hiker had reported hearing cries for help, but had to hike a long distance to get cellphone reception. The time of the 911 call was 5:08 p.m. By the time rescuers responded to the scene the decedent was motionless and unresponsive. His body was described as arched backward with his chest and face towards the falls. His recovery from the scene was delayed due to darkness and environmental conditions. The next day, he was pulled up from the falls, confirmed dead, and transported to the Medical Examiner's Office. He was known to be an avid rock climber and his car was found parked at the trailhead to the falls. The decedent had left his house in the early afternoon and had told his roommate that he was going to make the descent at the falls. According to family, his medical history was unremarkable.

At autopsy he had multiple scrapes and contusions of the skin, but no evidence of internal trauma. At least some of the abrasions appeared to have occurred during the recovery. Other findings were suggestive of asphyxia including numerous periorbital and conjunctival petechiae. No internal neck, head, chest, or abdominal trauma was found**,** and no pre-existing natural disease was noted. No alcohol, basic medications, or common drugs of abuse were detected on toxicologic testing. There was no evidence of neck compression and no specific findings suggestive of drowning. It is believed the mechanism of death was a result of mechanical asphyxia and probable hypothermia.

If conscious, someone in the decedent's position would be expected to exert oneself in an effort to escape or regain control until the point of exhaustion, unconscious, or death. The exertion itself along with panic or other emotional factors may also play a role. In this case, the rock wall was wet and covered with vegetation so there was little chance of climbing back up or even getting a foothold in order to transfer body weight from the harness. Of course, one would be unable to escape being suspended if an injury or other preceding event had already caused unconsciousness. Other factors considered in this death case were the possible roles of drowning and hypothermia. As seen and inferred by the video the body was not constantly or consistently in the water and the autopsy did not show evidence of drowning. Therefore this mechanism is unlikely. However, hypothermia may well have been a factor.

The literature theorizes that suspension stress or harness hang syndrome is due to orthostatic hypotension along with other possible cardiovascular mechanisms; however, this has not been verified experimentally. It is believed the mechanism is probably respiratory, not cardiovascular, and that these types of deaths should be considered a form of mechanical asphyxial. This may be the result of direct compression on the chest or abdomen impeding the ability to breath (traumatic asphyxia) or a body position that interferes with the ability to maintain an open airway (positional asphyxia). The body compression may be from the harness or its attached ropes and straps and may be influenced by the body's position. The position may vary depending upon the state of consciousness, the type of harness and attachments and how they are positioned. It is uncertain how long one must be suspended in order to have adverse effects, and obviously the time frame could vary depending on the circumstances.

Until further research and analysis of similar deaths are undertaken, the nature, physiological effects and dangers of harness suspension are still largely unknown. However, one should be aware of the potential risks of prolonged harness suspension while unconscious or otherwise.

Harness Hang, Suspension, Rappelling

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