IRATA International code of practice for industrial rope access

Part 3: Informative annexes

Annex G: Suspension intolerance

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1	2013-Sep-01	Front cover: *September 2013* replaces *2013 edition*. This page: change of IRATA address and telephone number. Date in footer updated. All the changes are classed as editorial.
2	2014-Jul-10	Typo in G.2.4 corrected: reference to G.3 should be to G.1.3.

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Annex G (informative)
Suspension intolerance (formerly known as suspension trauma)

Introduction

Annex G gives advice and other information that could be relevant to users of rope access methods and is one of a number of informative annexes in Part 3 of this code of practice. This informative annex should be read in conjunction with other parts of this code of practice, should not be used in isolation and is not intended to be exhaustive. For further advice, readers should refer to relevant specialist publications.

WARNING! The advice given in this annex is known best practice at the time of publication. It is essential that persons responsible for rescue plans and rescues keep themselves fully up to date with current practices.

G.1 General

G.1.1 Suspension intolerance is a condition in which a suspended person, e.g. in a harness, can experience certain unpleasant symptoms, which can lead to unconsciousness and eventually death. The reason for this is that the body is not tolerant of being in an upright position and motionless at the same time. Persons likely to be affected are those who are suspended in a generally upright position and who are motionless, for example, when seriously injured or unconscious, or when fastened vertically in a stretcher.

NOTE Suspension intolerance is also currently known by several other names, which include suspension trauma, orthostatic intolerance and harness-induced pathology.

G.1.2 The condition has been suspected in cases of mountain climbers who fell and were then suspended for up to several hours. Some of these climbers died after rescue up to eleven days after their fall, for reasons that have been postulated by medical professionals as being due to suspension intolerance. There have also been instances of cave explorers becoming stuck on their ropes and who have died either while still on them or not long after being rescued. The reason for some of these deaths was again attributed to suspension intolerance. Some of the symptoms have been experienced by rescuees feigning unconsciousness in rescue training scenarios. The condition has been produced under experimental circumstances in persons who were suspended in a harness in a generally upright position and who were motionless. In these clinical trials, where the test subjects were told not to move, most experienced many of the effects of suspension intolerance, some including loss of consciousness, in just a few minutes. Others managed for longer before reporting symptoms. A similar situation might arise in a worker who falls into suspension and is not moving, e.g. due to being exhausted, badly injured or unconscious.

G.1.3 Muscular action in moving the legs normally assists the return against gravity of blood in the veins back to the heart. When the body is motionless, these “muscle pumps” do not operate and if the person is in an upright position, an excess of blood pools in the veins of the legs, which are capable of a large expansion and, therefore, have considerable capacity. The excess of blood in the veins is known as venous pooling. The retention of blood in the venous system reduces the circulating blood volume and causes a disturbance of the circulatory system. This can lead to a critical reduction of blood supply to the brain and symptoms which include a feeling by the person that they are about to faint, nausea, breathlessness, disrupted vision, paleness, giddiness, localized pain, numbness, hot flushes, initially an increase in pulse and blood pressure and then a decrease in blood pressure below normal. The symptoms are known as pre-syncope and, if the condition is allowed to develop unchecked, can lead to unconsciousness (fainting) — when it is known as syncope — and eventually death. It is possible that other organs critically dependent on a good blood supply, such as the kidneys, could also suffer damage, with potentially serious consequences. It seems that even the fittest person may not be immune to the effects of suspension intolerance.

G.2 Advice

G.2.1 Normal movement of the legs (e.g. when ascending, descending or working while suspended) will activate the muscles, which should minimize the risk of excessive venous pooling and the onset of pre-syncope. It is recommended that harness leg-loops are wide and well-padded, as this should help to spread the load and reduce possible restrictions to blood-flow through the arteries and veins in the legs. The use of a work seat should be considered if one position is expected to be sustained for an extended period.

G.2.2 Although there is little evidence of the effects of suspension intolerance occurring in the industrial rope access environment, an effective rescue plan is essential to ensure that, following an incident, a casualty can be removed quickly from the suspended position and cared for in a proper manner. The longer the casualty is suspended without moving, the greater the chances there are of the effects of suspension intolerance developing and the more serious it is likely to be.

G.2.3 A person suspended motionless in a harness awaiting rescue is likely to tolerate suspension better with the knees elevated. During rescue, elevation of the legs and movement of them by the casualty or assisted by the rescuer, where safely possible, may be helpful. The casualty should be removed from suspension as soon as possible. This is particularly important for a casualty who is motionless.

G.2.4 Rope access personnel should be able to recognise the symptoms of suspension pre-syncope, see **G.1.3**. Motionless head-up suspension can lead to pre-syncope and sometimes syncope in most normal subjects within 1 hour and to 20% of subjects within 10 minutes. Syncope can follow thereafter at an unpredictable time.

G.2.5 During and after rescue, standard first-aid guidance should be followed, with an emphasis on airway, breathing and circulation management (ABC). Assessment of any injuries should include those which may not be apparent, e.g. damage to the neck, back and vital internal organs.

G.2.6 In accordance with advice given in a literature research and assessment carried out by the UK Health and Safety Laboratory (HSL) in 2008 (HSE/RR708 *Evidence-based review of the current guidance on first aid measures for suspension trauma*), the fully conscious casualty may be laid down and the semi-conscious or unconscious casualty placed in the recovery position (also known as the open airway position). This differs from earlier advice.

G.2.7 All casualties who have been suspended motionless in a harness should be taken to hospital immediately for further professional medical care and observation. Medical personnel should be advised that the casualty may be suffering from the effects of suspension intolerance.

G.2.8 Those preparing rescue plans should regularly review current best practice.