Suspension Trauma

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Prerequisites

Before attempting this module, you must have demonstrated that you can properly:

1. Apply First Aid.
2. Understand and explain basic terminology used in First Aid.
3. Understand and explain the fundamentals of Safety in Vertical Rescue or Working at Heights.
4. Use and care for rope.
5. Use and care for other equipment employed in vertical rescue or safe working at heights.
6. Tie correctly, confidently, and without hesitation the knots required for your protocols.
7. Apply the principles of anchoring and rig a safe and secure anchor.

Objectives

At the completion of this module, you should be able to:

1. Explain what is currently understood about how Suspension Trauma comes about.
2. Discuss the importance and urgency of rescue of someone succumbing to Suspension Trauma.
3. Discuss how to minimize the risk of suspension trauma on a stretcher bound casualty.
4. Discuss how to minimize the risk of suspension trauma on yourself and fellow operators.
5. Recognize situations where Suspension Trauma may be a significant factor.
6. Explain how to recognize someone in the developing stages of suspension trauma.

Terms

Pathology - study of illness or disease, and how it affects the body.

Suspension - hanging in a harness or other support which maintains the attitude of the body.

Trauma - serious wound or abnormal condition.

What is Suspension Trauma?

Suspension Trauma is a particularly insidious hazard for all people who may work in harnesses. It can result in unconsciousness, followed by death, in less than 30 minutes. It is a relatively recently discovered hazard, and as such, research is still in its infancy. After a study into a number of similar deaths of cavers while prusiking, the Medical Commission of the French Federation for Speleology concluded there was a common link beyond the previous official cause of death of "exhaustion". That cause has become known as Suspension Trauma or Harness Induced Pathology.

We have all seen or heard about what happens to someone standing motionless for some time, let's say, on a parade ground or a school assembly. Occasionally, someone faints and falls over. The reason they faint is generally accepted to be lack of blood to the brain. In nature, the problem is self rectifying, when the person falls down, blood can get to the brain again. The reason the blood fails to get to the brain is the immobility of the person's limbs. The heart does most of the work pumping blood around the body, but when we are standing it has a hard job getting it to the top without assistance. That assistance is usually provided by movement of the muscles in the arms and legs in particular, which help to move the blood back up the veins. When someone remains totally motionless in a near vertical position, the heart is doing all the work by itself, and some accumulation of blood in the lower extremities results.

When suspended in a harness, we are prevented from falling over and correcting any feeling of faintness or lack of blood to the brain. It should be noted that research has shown that Suspension Trauma can result as long as the legs are immobile and lower than the heart. So even relatively flat inclinations of the body can result in the condition developing. Research has also indicated that the type and fit of a harness is essentially irrelevant to the development of suspension trauma.

Who is at Risk?

Anyone who works or uses a harness for recreation may be at risk of suspension trauma if they were to hang motionless in the harness. Casualties immobilized in a stretcher in a vertical lift or head up position may also be at risk. Anybody sustaining a head injury while on rope is particularly at risk, especially if they lose consciousness.

Factors which affect the degree of risk are:

- The ability of the person to move their legs to assist circulation.
- Dehydration.
- Hypothermia.
- Shock.
- Fatigue.
- The degree of inclination of the body.
- Consciousness.

Casualties in a vertical rescue will often be suffering from shock, and may be prevented from moving their legs by injuries or immobilization in the stretcher. They may also suffer from other factors such as fatigue, hypothermia and dehydration.

Vertical Rescuers may also suffer fatigue, dehydration and hypothermia while on the job, placing them at risk particularly on long or difficult ascents. In the event of a head injury, as the result of a fall or impact, they may be particularly at risk.

Storm Damage Operators are also at risk should they fall either through a roof or over the edge of a roof to find themselves suspended by their safety harness. These operators are likely to be suffering from shock, but also possible hypothermia, fatigue and injuries caused by the fall.

Anyone working at heights using a safety harness and fall arrester or belay of some sort is similarly at risk.

What are the Warning Signs?

- Subject may feel faint.
- Pulse rate will increase until faintness. Blood pressure will rise concurrently.
- Paleness.
- Hot flushes.
- Sweating.
- Breathlessness.
- Unconsciousness.

The following are all observations made from research cases of suspension trauma. Any and all symptoms and signs of faintness and shock may be apparent.

Management of Suspension Trauma.

The best way to manage Suspension Trauma is to prevent it, or avoid situations where it may arise. In situations where it cannot be avoided, it is vital that it is recognized and addressed immediately. It is life threatening!

Warning:

Whatever the type of harness, motionless suspension is not physiologically safe and will eventually lead to very serious blood circulation problems.

Casualties:

- **Stabilize the casualty first.** Time spent stabilizing the casualty before handling will make them more robust and less susceptible to suspension trauma. The more hypothermic, dehydrated, or shocky a casualty is, the higher their susceptibility to suspension trauma.
- **Avoid vertical lifts**. It isn't always practical, but avoid vertical lifts and head

up positioning as much as possible. Very shocky and dehydrated casualties have been known to seize and die simply by having their head raised above the rest of the body during normal stretcher handling manoeuvres. Try to keep the casualty horizontal particularly if unconscious.

- **Minimize the time in vertical lifts.** Vertical lifts cannot always be avoided. Minimizing the time the casualty is in a vertical (or head up) position is important if the casualty has leg injuries or is otherwise unable to assist by doing the "parade ground twitch" to flex leg muscles. Get the casualty to assist by performing the "parade ground twitch" (flex leg muscles) if they are capable.
- **Closely monitor vital signs.** This is vital in any vertical lift or head up position for the casualty. Suspension Trauma can develop extremely quickly. If the casualty is capable, get them to tell you how they feel and to let you know if that changes at all. It may be the early warning you need!

Operators:

- **Recover before a long or difficult prusik.** Do not attempt long or difficult prusiks when fatigued, hypothermic, dehydrated or very hungry (low on energy). Take time to recover prior to a difficult or long prusik.
- **Minimize time in Suspension.** Avoid tasks which require a long time suspended in the harness with little movement. An operator in difficulty on rope, due to exhaustion or technical problems, must be helped very quickly. An operator or victim hanging completely inert must be unhooked as quickly as possible.
- **Use the Buddy System.** An operator in difficulty on rope, due to exhaustion or technical problems, must be helped very quickly. An operator or victim hanging completely inert must be unhooked as quickly as possible. Where possible, for example with roof safety systems, this should be considered when rigging the safety system in the first place. Never allow an operator to begin a rope ascent alone, even if in very good shape - always use the buddy system.
- **When in Difficulty...** Operators finding themselves in difficulty due to suspected Suspension trauma should try to:
  - Enlist the help of their buddy or team.
  - Make a conscious effort to use leg muscles to assist circulation.
  - In serious situations, hang inverted or at least with legs above head level for a minute or two. The return of blood to the head from the legs may induce quite a painful headache. The operator should ensure they are capable of righting themselves again.

Questions for Review

1. What is the best way to manage Suspension Trauma?
2. Who is at risk of Suspension Trauma?
3. List the factors that contribute to the development of Suspension Trauma.
4. What are the signs and symptoms of which indicate the development of Suspension Trauma?
5. Why is fainting so serious when suspended in a harness?
6. Why is hanging motionless in a harness so dangerous?
7. List the things that an operator can do to avoid becoming a suspension trauma victim.
8. What things should an operator do that suspects they may be succumbing to suspension trauma?
9. List the ways that suspension trauma can be controlled in a stretcher casualty.
10. Why is a rapid response to a suspected suspension trauma casualty so urgent?
11. List the ways you could rescue an unconscious casualty from each of your usual rigs.

Activities

Draw diagrams of how you can setup or modify the common rigs you use to facilitate rapid rescue of an injured or unconscious operator.

Develop, or learn existing, agreed protocols for rescue of persons suspended in a harness.

Practice and demonstrate agreed protocols for rescue of persons suspended in a harness.

References, Bibliography and Acknowledgements

http://www.fallsafety.com/pages/suspensiontrauma.htm

http://www.rigg-access.com/rope/article.html

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