



TOOL BOX 067- Working at Heights - safety

What Is Suspension Trauma

So you work at heights – What happens if you fall, and not rescued fast enough

An injury that is caused by the Fall Arrest or Rope Access harness

This occurs when the blood flow is cut off to the legs by the harness.

The medical effects of immobilisation in a vertical position

Medical term is 'Orthostatic Intolerance'

The effects are nothing new Crucifixion is death from suspension trauma

It presents an immediate threat of death to anyone immobilised in a vertical position

Hanging still in an industrial, theatrical or sport harness

Stretcher patients, performers, stuntmen, confined space workers

The onset and progress is rapid and unpredictable





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What Is Suspension Trauma

What you must learn - When you fall

- ✓ how to recognise, manage and prevent suspension trauma
- ✓ It does not normally affect people who wear a harness but who are:-
 - * Actively moving about (climbing, caving, etc.)
 - * Suspended for only a minute or two (parachutists)
- ✓ The danger is when you are unable to move, or forgets to bother!

Recognition of trauma – Understand and control the symptoms

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What Is Suspension Trauma

Humans are not designed to stand upright

- ✓ Our circulatory system was built for life on all fours
- ✓ Volume of blood vessels is much greater than that of the blood

So, when we stand upright we have a problem

- ✓ Gravity pulls your blood into your legs
 - * Your heart is a positive-pressure pump – it cannot suck!
 - * The only way to get the blood back out of the legs is to pump it using another method.

Luckily, we've evolved Muscular pumps

The veins in your legs are entwined within the skeletal muscles, and when you move your legs, these muscles squeeze the veins, pushing the blood out of the way

Factors Aiding Venous Return: The Muscular Pump





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We have one-way valves in these veins, so each squeeze can pump the blood a short distance towards the heart

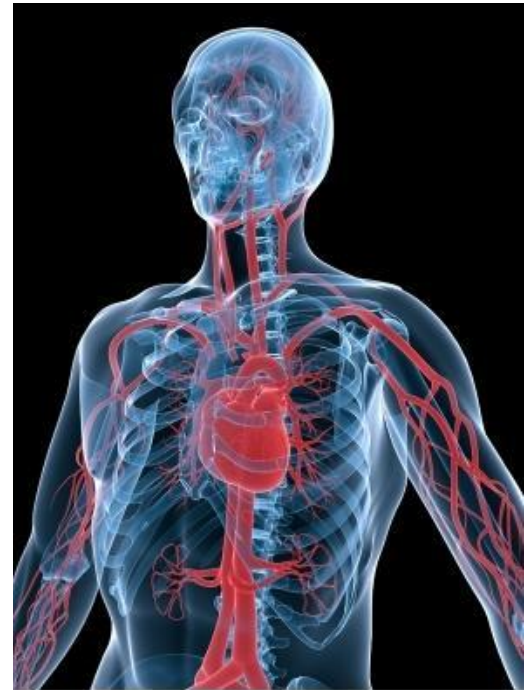
Providing you are walking around, this process makes a 'heart in each leg' – and it's very effective!

Try it – take your socks off and stand still – look at your feet and you'll see the veins all standing out and the skin red.

Now walk around in a little circle and look again – the veins are empty and flat, and the skin goes pale. Pumping in action!

What If Your Blood Is Not Pumping & Circulating?

- ✓ If the muscles are not pumping the blood upwards, it pools in your legs
 - * You can 'lose' several litres and go into shock
- ✓ Your brain tries 'shock' for a while, but of course it doesn't help – blood is still stuck in your legs.
- ✓ After a few minutes, the brain goes for the last-ditch method
"If I faint, I fall over. I get the blood back"





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Your Brain assumes you must fall over. If you stay upright:-

Your brain has no oxygen supply

Your airway is at risk

You will probably die within minutes

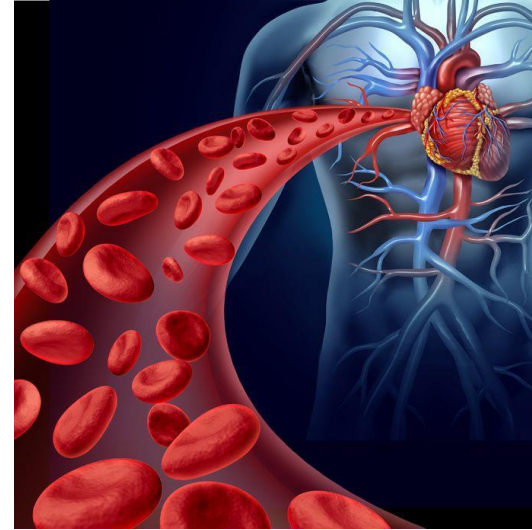
Orthostatic Intolerance

1. Passive Death

This is when the blood flow is restricted and the body tries to fix it.

First the body raises the blood pressure and heart rate, then when this doesn't work it reverses the process dropping the heart rate and blood pressure. This makes the victim lose consciousness. The problem is not resolved as the victim is still hanging in the same position, the body keeps dropping the heart rate and blood pressure till the victim's heart stops completely.

An example of a rare scare recorded incident happened during US navy seal training simulation, an instructor simulating a rescue was found dead after only 6 minutes hanging in a harness.





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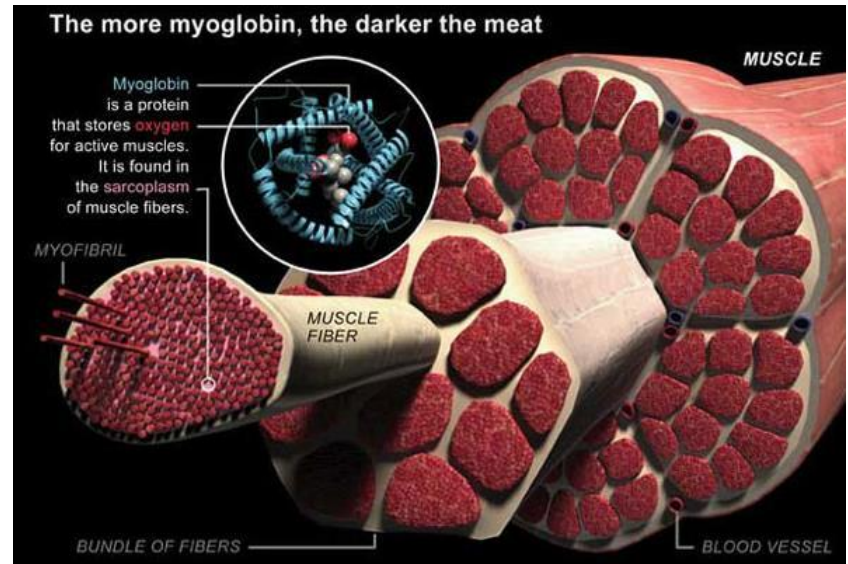
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2. Blood Poisoning the Body

In a fall the victim can seriously injure the body in a cellular level

When a cell dies it releases a chemical called myoglobin this is normally cleaned by the liver and kidneys

The amount of injuries sustained by the fall along with the other factors like the pressure in the legs caused by the restriction of the harness, increases the amount of this poisoning, so when the blood flow is restored this myoglobin attacks the kidneys to the point that the victim may suffer from immediate kidney and renal failure.





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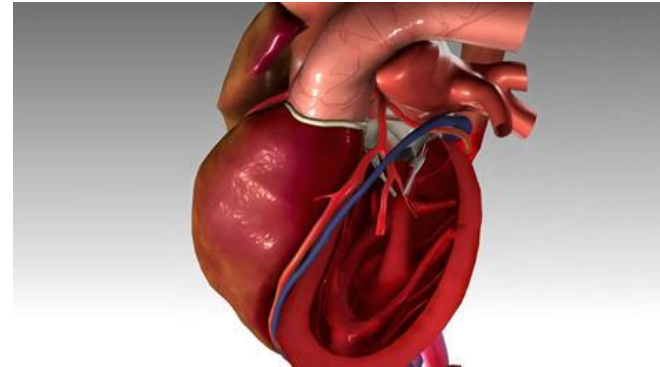
3. Heart failure

When the blood is not circulating through the body it becomes starved of oxygen and for which the victim can get a platelet build up in the blood. Platelet is what causes the heart to beat. The excess of platelet could cause heart failure when the blood flow is returned.

Who Is Susceptible to this Risk?

The 'classic group' are people who wear harnesses
Sport climbers, cavers, parachutists, par ascenders, etc.
Industrial climbers
Confined space workers lowered using a harness and winch
Theatrical and circus performers, stuntmen and artists

There are other ways to be 'immobilised'
Rescue stretchers, spine boards and splints
Becoming stuck in a confined space





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So what happens?

General feelings of unease

Dizzy, sweaty and other signs of shock

Increased pulse and breathing rates

Then a sudden drop in pulse & Blood Pressure

Instant loss of consciousness

If not rescued, **death is certain**

How can suspension trauma be avoided?

1. Training
 - a. General
 - b. Site Specific

US229994 Assess a worksite for work at height and prepare a fall protection plan

- c. Daily Task Talks
- d. Daily fall equipment inspection





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- g. Daily Task Talks
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3. Standing Step

If you do not have one of these straps (very rarely issued) - Fingers crossed for a quick rescue

4. Rescue

US229995 Install, use and perform basic rescues from fall arrest systems and implement the fall protection plan

US229999 Perform a range of advanced fall arrest rescues

5. Medical response

Extracts from presentation by Ruaan Breedt - SAPEMA

Presented By: Name: _____	Date _____	Signature _____
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