

A Case Of High Doppler Scores During Altitude Decompression In A Subject With A Fractured Arm

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Background

Astronauts and Cosmonauts must decompress from saturation before space walks.

Previous studies on earth with similar pressure profiles show up to 85% incidence of venous gas embolism (VGE) and 78% of decompression illness (DCI) after 6 h.

In contrast, no DCI events have been reported from the US or Russian space activities so far, or during simulations with supine subjects on ground (see accompanying poster).



Fracture in the Scaphoid Bone (Hand Navicular Bone)



Fracture in the Radial Head (Caput Radii)



Methods

See accompanying poster.

Results

Out of the 20 subjects, only one showed large numbers of detectable VGE (KM Doppler scores of grade III or above). This subject reported no DCI symptoms.

Subject with VGE

rest / flex (KM Doppler score)

0 / 3- @ 56 min into hypobaric exposure

3 / 3+ @ 1h 34 min → recompression

0 / 0 @ 47 min after start of recompression

During the preceding medical examination the subject reported a tender right lower arm (the dominant side). He had had these symptoms for 19 days and also visited a physiotherapist.

The subject showed slight right-sided weakness and it was believed at the time to be a muscle strain or tear. Five days after the experiment x-ray showed fractures in the Scaphoid bone and in the Radial head.

This subject had large numbers of detectable VGE (KM Doppler scores of grade III or above) after 56 minutes at altitude and at 5 occasions during the ensuing 38 minutes before recompression.

The other subjects had Doppler scores of zero for at least 98 min (n=19), 2 h (n=18) and in some for 6 h (n=6) (see accompanying poster). No DCI symptoms were reported.

Discussion

A subject with a relatively recent fracture, and most likely with an associated soft tissue damage, was unintentionally exposed to altitude decompression.

In a group of 20 subjects exposed to the same decompression regimen, he was the only one who showed clear signs of VGE.

We speculate that local inflammatory processes and / or local endothelial damage in the fractured area could increase formation of, or entry of, decompression gas bubbles into the blood.

To our knowledge there are no previous reports on humans with muscular / skeletal injury exposed to altitude decompression.

However, reports of cats exposed to hypobaric pressures after trauma show increased levels of VGE and DCI.



Pre-cordial Doppler ultrasound for VGE detection

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