

PERSISTENCE OF RIGHT HEART BUBBLES IN A HYPERBARIC TECHNICIAN AFTER ROUTINE HBOT EXPOSURE: DETECTED INCIDENTALLY BY ECHOCARDIOGRAPHY

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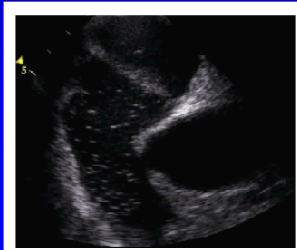


BACKGROUND:

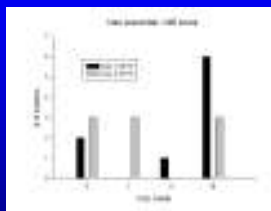
Asymptomatic venous gas emboli (VGE) resulting from decompression have been described since the advent of audible Doppler technology. While the likelihood of VGE tends to increase with decompression stress, individuals uniquely susceptible to "bubbling" have been described. Attendant decompression illness (DCI) has been reported from routine HBO exposures and the risk is thought to be reduced by oxygen decompression, perhaps by decreasing VGE.

Risberg and colleagues exposed 9 female subjects for 3 consecutive days to the routine hospital procedure of compressed air exposure to 240 kPa for ~115 min with 12 min of terminal oxygen (O₂) breathing. VGE were monitored with ultrasound Doppler at 15 min intervals for 2h after the first and third exposure. Grade III VGE was observed in six and three subjects Days 1 and 3 respectively.

Walker and colleagues measured VGE by Doppler in 18 subjects after a 10 msw/90 min and 18 msw/60 min protocol. The subjects breathed O₂ during the 30 min decompressions in both series. Although most subjects experienced low grade VGE (Grade 0 or I), bubbles were detected in 44% of exposures at 2 ATA, and 68% of exposures at 2.8 ATA. Grade III VGE were observed in two subjects following the 18 msw exposure and in one subject after the 10 msw exposure. One subject who did not exhibit VGE suffered neurological DCI.



(see live time cardiac echo)



From Risberg, J, Englund M, Aanderlund L, Eftedal O, Flook V, et al, Venous gas embolism in chamber attendants after hyperbaric exposure, UHM 2004; 31 (4) 417-29.

CASE REPORT:

A 52 year old Caucasian male hyperbaric technician underwent an uneventful hyperbaric air exposure at 2 ATA x 100 minutes with an additional 10 minutes of 100% oxygen at depth prior to ascent at 1 meter per minute.

Two hours later, he underwent a routine transthoracic echocardiogram which demonstrated asymptomatic right heart VGE in both the atria and ventricle. No symptoms of DCI were reported.

Four years prior, the same technician had developed the rapid onset of neurological DCI (back pain followed by lower extremity weakness) 15 minutes after surfacing from a routine exposure to 2.4 ATA x 90 minutes (no oxygen decompression). He was a former Navy Deep Sea Diver and sport Scuba diver with several thousand life time dives and no known history of decompression illness. Symptoms resolved completely upon immediate recompression (USN TT6). Doppler bubble microcavitation study was negative for a patent foramen ovale and MRI/MRA of the spinal cord with contrast revealed an anatomically normal cord. Although released to return to dive, after this event the technician discontinued in-chamber work for some months. The hyperbaric facility instituted a standard protocol of oxygen decompression at depth for 10 minutes. The technician returned to duty assuming exposures not deeper than 2.0 ATA conferred a safety advantage.

CONCLUSION:

VGE have been reported after exposures of 2 ATA or less, however, the persistence of bubbles two hours after surfacing from oxygen decompression at depth is surprising. Whether this represents a unique susceptibility to "bubbling" in this individual is unknown, although the history of severe DCI in the same individual after routine HBO exposure is intriguing.

DISCUSSION

VGE following routine exposures, and despite oxygen decompression are well described. Rates of DCI up to 0.76% have been reported in hyperbaric attendants exposed to routine hyperbaric treatments of 14 msw (2.4 ATA). A number of measures have been recommended to reduce the DCI risk in chamber attendants. The USN extended the O₂ breathing period for chamber attendants in 1993 to lower the estimated DCI risk from 3.3% to 0%. The US Air Force adopted the "Nobendem" procedure in 1999. At our facility we adopted oxygen breathing at depth rather than on decompression after this individual suffered DCI. Whether there are unique factors which predispose certain individuals to VGE, and whether this increases their risk of DCI is not known. This individual, although in his 60th decade, was extremely physically fit. Whether other safety measures should be implemented to protect hyperbaric technicians from VGE is not clear.

REFERENCES:

- Risberg, J, Englund M, Aanderlund L, Eftedal O, Flook V, et al, Venous gas embolism in chamber attendants after hyperbaric exposure, UHM 2004; 31 (4) 417-29.
- Walker, M, Capps, R, Pirone, C, Ramsay, R. Doppler detection of circulating bubbles in attendants, decompressed on oxygen, following routine hyperbaric treatments. SPUMS 1979 , Volume 9 No. 2.
- Doolette D, Goble S, Pirone C, Health outcome of hyperbaric-chamber inside attendants following compressed-air exposure and oxygen decompression, SPUMS 2004, Volume 34 No. 2, p 63-67.