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Title: Bubble growth and mechanical properties of tissue in decompression

Authors: Vann, RD
Clark, HG

Keywords: decompression
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Abstract: A survey of decompression literature leads to the conclusion that when tissue is subjected to gaseous supersaturation, pre-existing gas micronuclei grow into the gas bubbles which are routinely observed in decompression studies. These micronuclei may originate from mechanically induced tribonucleation or cavitation within joints. A new tissue model for decompression sickness based upon failure theory in rubber is proposed. The model shows theoretically that pre-existing sea-level nuclei can be stabilized at depth by elastic forces in tissue. These same elastic forces restrain the growth of nuclei when supersaturation occurs. Mechanical stress will lower the gaseous supersaturation required for growth of nuclei. Gaseous supersaturation, mechanical stress, and the elastic properties of various tissues interact to produce unbounded bubble growth leading to tissue lesions when combined gaseous and mechanical supersaturation exceeds a threshold value. The recommendation is made that the high levels of supersaturation generally used for the decompression of men be reduced.

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