

Hyperbaric Oxygen: Does it promote growth or recurrence of malignancy?

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Feldmeier J, Carl U, Hartmann K, Sminia P, Hyperbaric oxygen: Does it promote growth or recurrence of malignancy? *Undersea Hyperb Med*; 30(1): 1-18 - It has been a concern that a therapeutic modality recommended as an adjunct to healing and administered to promote proliferation of fibroblasts, epithelial cells and blood vessels in a wound could also lead to proliferation of malignant cells and angiogenesis in a malignant tumor. The first reported concern that hyperbaric oxygen (HBO₂) might have cancer growth enhancing effects appeared in a paper by Johnson and Lauchlan in 1966. In a series of patients treated with HBO₂ radiosensitization, they reported a more frequent than expected incidence of metastases and an unusual pattern of metastases. The published literature from clinical reports, animal studies and cell culture studies are reviewed. Putative mechanisms whereby HBO₂ could have carcinogenic effects are discussed. The processes of angiogenesis in wound healing and in cancer growth are compared and contrasted. *In vitro*, *in vivo* and clinical studies strongly suggest no more than a neutral effect of HBO₂ on tumor growth. In fact some studies suggest a negative impact of HBO₂ on malignant progression or formation. For angiogenesis, similarities in wound healing and cancer are striking but significant differences are found including the relative importance of angiogenic factors and the process of cessation of angiogenesis. Tumors that grow in hypoxic environments are more prone to metastases and more lethal to the patient. They are also more likely to mutate toward resistant genotypes. Discussion of postulated mechanisms of carcinogenesis including free radical and immunosuppressive effects points out why they are not likely to enhance or cause cancer growth or initiation. In conclusion, the published literature on tumor angiogenesis mechanisms and other possible mechanisms of cancer causation or accelerated growth provides little basis for HBO₂ to enhance malignant growth or metastases. A history of malignancy should not be considered a contraindication for HBO₂ therapy.

Hyperbaric oxygen, carcinogenesis, metastasis, angiogenesis, free radicals, immune suppression

INTRODUCTION

Practitioners of hyperbaric medicine have had concerns that a therapeutic modality which is recommended as an adjunct to healing and administered to promote proliferation of fibroblasts, epithelial cells and blood vessels in a wound could also lead to proliferation of cancer cells and angiogenesis in a malignant tumor. Since cellular and vascular proliferation is promoted by HBO₂ in a healing wound, we might assume that it would have the same effect in a tumor. This line of reasoning is indeed understandable at first glance, but it fails to recognize important differences between the complex physiology of wound healing and the equally complex and unique pathophysiology of malignant transformation, tumor growth and metastases.