Indocyanin Green Angiography (ICGA) may demonstrate angiogenic effect of hyperbaric oxygen therapy

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Introduction

ICGA is a new imaging technology with the potential to change the way we monitor the angiogenic effects of hyperbaric oxygen therapy

- ICG is a fluorescent dye that is injected intravenously via a peripheral IV
- Binds to plasma proteins and is confined to the intravascular space
- Half-life of 3-4 minutes so multiple images can be obtained in relatively short order
- Hepatically metabolized and can be given to patients with renal insufficiency
- Quantitative analysis can be done using calculations of Ingress and Ingress Rate of ICG

Methods

We performed ICGA on a series of patients before and after they received a series of hyperbaric oxygen therapy

- Three patients were getting treatment for Wagner 3 diabetic foot infections
- Two patients were getting treatment for chronic radiation tissue injury to the sacrum

Results

Post-hyperbaric oxygen images showed

- Subjective increase in the brightness of the ICG uptake
- Subjective increase in the total surface area of uptake
- Correlation with a clinical improvement of the patients' wounds
- Quantitative measurements did not correlate with qualitative observations

Discussion

- A greater amount of ICG dye was seen in post-hyperbaric images than pre-hyperbaric images
- The brighter intensity of the images is thought to correlate with increased angiogenesis and a positive response to hyperbaric oxygen therapy
- Several confounders exist, however, including variations in dosing of the ICG dye, positioning of the camera, or factitious results due to external factors

Conclusions

- ICGA has the potential to visually demonstrate capillary angiogenesis, something that we have extrapolated from transcutaneous oxygen measurements
- Routine use of ICGA could become standard practice to demonstrate a positive response to hyperbaric oxygen therapy
- More rigorous studies need to be conducted to verify these results, including standardized testing protocols in order to avoid factitious results

Diabetic Foot Ulcers

Patient 1

Image	HBOT #3	HBOT #30
Ingress	253	245
Ingress Rate	43.4	30.4

Patient 2

Image	HBOT #1	HBOT #23
Ingress	178	231
Ingress Rate	13.8	37.4

Patient 3

Image	Pre-HBOT	s/p 40 HBOT
Ingress	220	241
Ingress Rate	20.4	23.3

Image	Pre-HBOT	s/p 40 HBOT
Ingress	231	201
Ingress Rate	16.2	14.7

Chronic Radiation Tissue Injury

Patient 4

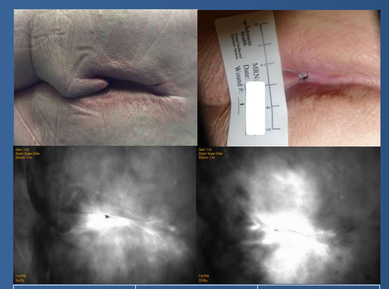

Image	HBOT #7	HBOT #28
Ingress	225	252
Ingress Rate	16.3	24.6

Patient 5

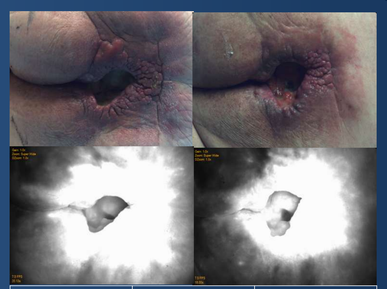

Image	HBOT #3	HBOT #18
Ingress	252	252
Ingress Rate	48.3	50.6