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Image Article

Glioblastoma & Hyperbaric Oxygen Therapy

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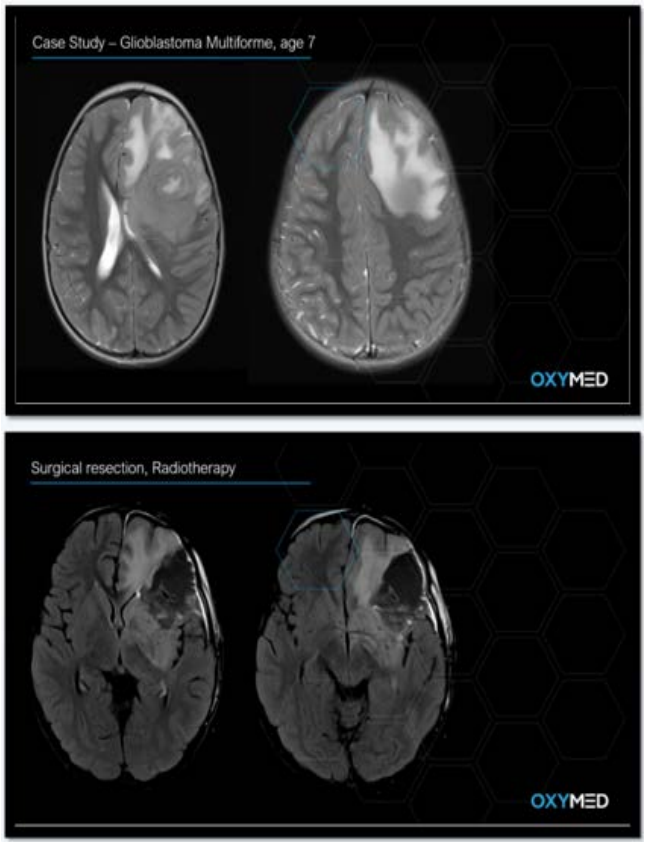
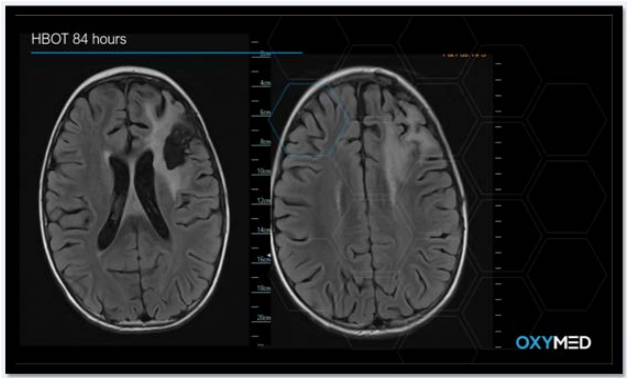
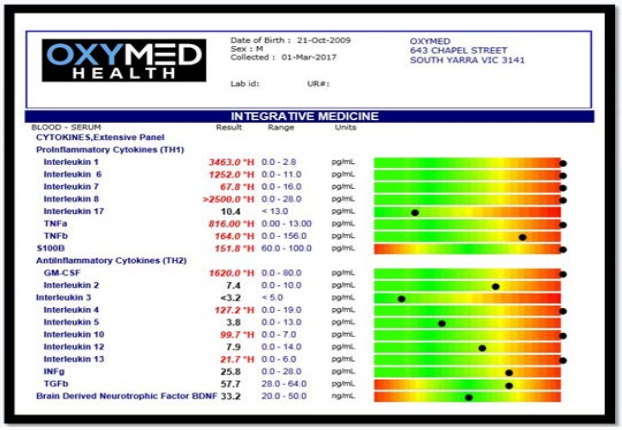


Young RH age 7 - Recurrent Glioblastoma (GBM) MRI January 2017, and again after surgical debulking. Young RH was listless after each radiation session.

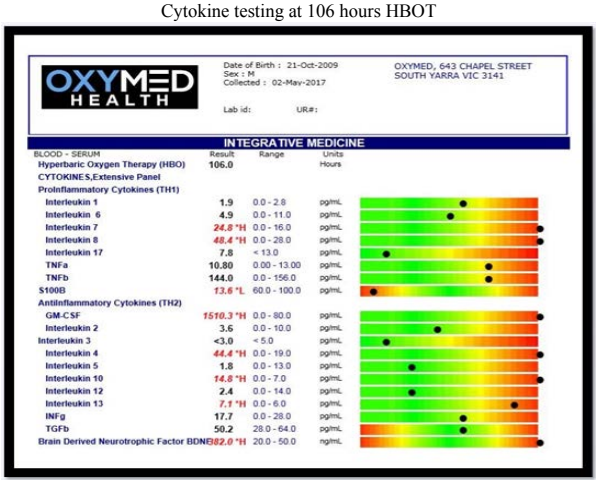


Hyperbaric Oxygen Therapy (HBOT) treatment interval: 4 weeks. RH received 84 hours of HBOT and further MRI.

Cytokine testing pre HBOT



Cytokine testing at 106 hours HBOT



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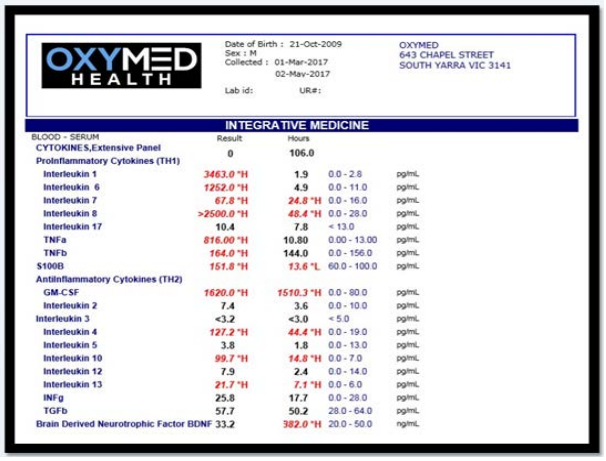
Cytokine testing comparison – interval 8 weeks



OXYMED HEALTH

Date of Birth : 21-Oct-2009
Sex : M
Collected : 01-Mar-2017
02-May-2017
Lab id: URR#:

OXYMED
643 CHAPEL STREET
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INTEGRATIVE MEDICINE

BLOOD - SERUM	Result	Hours		
CYTOKINES,Extensive Panel	0	106.0		
Proinflammatory Cytokines (TH1)				
Interleukin 1	3463.0 *H	1.9	0.0 - 2.8	pg/mL
Interleukin 6	1252.0 *H	4.9	0.0 - 11.0	pg/mL
Interleukin 7	67.8 *H	24.8 *H	0.0 - 16.0	pg/mL
Interleukin 8	>2500.0 *H	48.4 *H	0.0 - 28.0	pg/mL
Interleukin 17	10.4	7.8	< 13.0	pg/mL
TNFa	816.00 *H	10.80	0.00 - 13.00	pg/mL
TNFb	164.0 *H	144.0	0.0 - 156.0	pg/mL
S100B	151.8 *H	13.6 *L	60.0 - 100.0	pg/mL
Antiinflammatory Cytokines (TH2)				
GM-CSF	1620.0 *H	1510.3 *H	0.0 - 80.0	pg/mL
Interleukin 2	7.4	3.6	0.0 - 10.0	pg/mL
Interleukin 3	<3.2	<3.0	< 5.0	pg/mL
Interleukin 4	127.2 *H	44.4 *H	0.0 - 19.0	pg/mL
Interleukin 5	3.8	1.8	0.0 - 13.0	pg/mL
Interleukin 10	99.7 *H	14.8 *H	0.0 - 7.0	pg/mL
Interleukin 12	7.9	2.4	0.0 - 14.0	pg/mL
Interleukin 13	21.7 *H	7.1 *H	0.0 - 6.0	pg/mL
INFg	25.8	17.7	0.0 - 28.0	pg/mL
TGFb	57.7	50.2	28.0 - 64.0	pg/mL
Brain Derived Neurotrophic Factor BDNF	33.2	382.0 *H	20.0 - 50.0	ng/mL

RH was treated using Hyperbaric Oxygenation Therapy (HBOT) at 1.8 ATA and 100% O_2 with regular air breaks. RH continued with a strict ketogenic diet [1,2] and supplements focused on cytokine modulation. RH did not experience any side effects or seizures during or after HBOT sessions. RH's improvement whilst undertaking HBOT was extraordinary. He returned to school and mostly to a normal life. Oxygen that is given at a pressure that is higher than the pressure of the atmosphere at sea level. In medicine, breathing hyperbaric oxygen increases the amount of oxygen in the body. It is used in treating certain kinds of wounds, injuries, and infections. It is also used to treat carbon monoxide poisoning and other conditions in which the tissues are not getting enough oxygen [3]. It is being studied in the treatment of some types of cancer. Hyperbaric oxygen may increase the amount of oxygen in cancer cells, which may make them easier to kill with radiation therapy and chemotherapy. It is a type of radio sensitizing agent and a type of chemosensitizing agent [3,4]. HBOT assists immune responses to chemotherapy reducing immunosuppression and neutropenia [4].

Glioblastoma Multiforme (GBM) is the most common type of malignant intracranial tumor in adults and has a poor prognosis, with a median survival of about 12 months. It is rare in children with the prognosis unfavourable [5]. Despite advances in surgery and adjuvant treatment, the average survival is about 1 year, which has not been improved significantly during the last three decades [3,5].

Tumor hypoxia, high mitotic rate, and rapid tumor spread account for its poor prognosis [6-8]. Hypoxia alters cancer cell metabolism and contributes to therapy resistance [9]. Hypoxia stimulates a complex cell signaling network in cancer cells, including the HIF, PI3K, MAPK, and NFκB pathways. Tumor hypoxia and HIF cell signaling are involved in tumor blood vessel formation, metastasis, and development of the resistance to therapy [8,9].

Hyperbaric Oxygen Therapy may improve the sensitivity of radio-chemotherapy by increasing oxygen tension within the hypoxic regions of the neoplastic tissue [10].

Limited clinical trials and suggest that radiotherapy immediately after HBOT enhances the effects of radiotherapy in some cases [6,11]. HBOT also is able to strengthen the anti-tumor effect of chemotherapy when applied together [12]. Overall, HBOT is well tolerated in the GBM patients and does not significantly increase toxicity [6]. HBOT applied by itself as curative strategy against GBM and other cancer forms is controversial [13,14]. In addition to HBOT favorably managing the therapeutic resistance of GBM, research is now focussed on the multimodal or cocktail approaches to treatment, as well as molecular strategies targeting GBM stem cells [12]. The reoxygenation brings additional benefit of making glioblastoma multiforme cells even more responsive to the killing effect of a cytotoxin [12].

Discussion

HBOT has been described as the 'integrative bridge' between orthodox medicine and complimentary approaches. Oxygen is essential to drug delivery [15].

HBOT reduces inflammatory cytokines including IL-1β, IL-6, IL-8, TNF-α, S100B through several transcription factors regulating inflammation, including hypoxia inducible factor 1 (HIF-1), Nrf2 and NFkB [10,12-14,16].

HBOT up regulates the patient's own target specific Stem Cells {an 8-fold (800%) increase in circulating CD34+} [17,18].

HBOT enhances Mitochondrial respiration and function [12,19].

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