HBO2-Triggered Baroreflex: Mechanisms, Pathways, Benefits and Limitations

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Background:

Hyperbaric hyperoxia below 3 ATA inhibits sympathetic outflow and improves cardiac function through a baroreflex mechanism while HBO_2 above 3 ATA results in sympathetic overdrive and vagal withdrawal associated with oxygen seizures and lung injury.

Hypothesis: HBO2- activated baroreflex is a major contributor to an alteration in autonomic equilibrium

Aim: To evaluate HBO2-activated baroreflex: its mechanisms of initiation, neuronal pathways, effects on cardiovascular function and brain excitability, and its functional limitations

Methods

Animals: Anesthetized and conscious SD rats

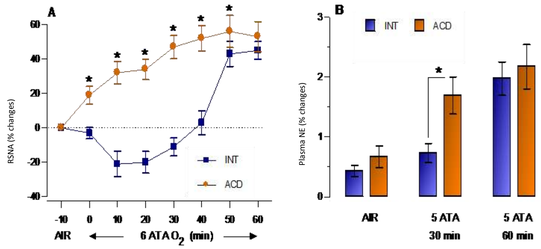
HBO_2 : 2.5 - 6 ATA

Measurements: Arterial and ventricular pressures, cardiac output, heart rate, cerebral blood flow, total protein in BAL fluid

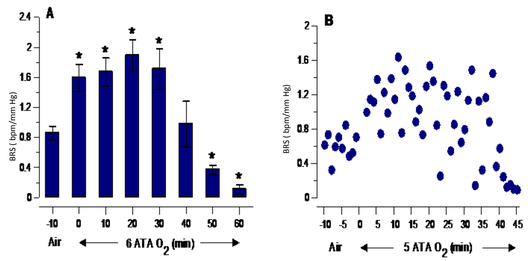
Monitoring: EEG, ECG, renal sympathetic nerve activity (RSNA) and body temperature

Calculations: Systemic and cerebral vascular resistance, baroreflex sensitivity

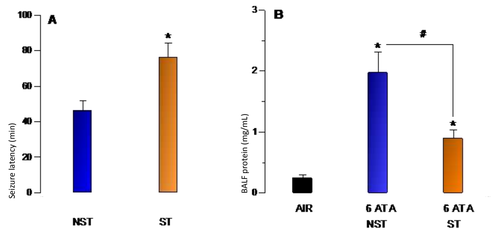
Interventions: Aortic and carotid baroreceptor deafferentation, electrical stimulation of aortic depressor nerve



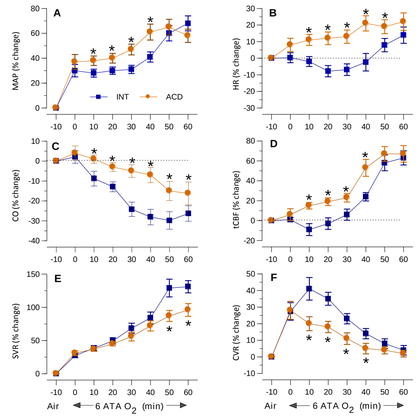
Baroreceptor Deafferentation Increased Sympathetic Drive (A) and Plasma Norepynephrine (B) in Rats Exposed to HBO2



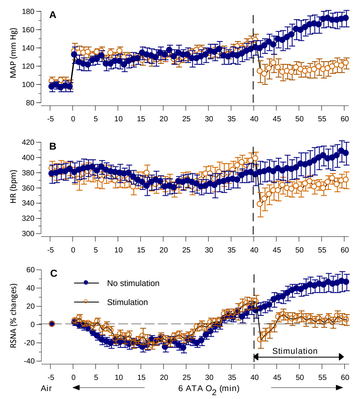
Baroreflex Function is Impaired in Extreme Hyperbaric Hyperoxia



Electrical Stimulation of Aortic Depressor Nerve Increases Seizures Latency (A) and Preserves Lung Injury (B)



Effect of Baroreceptor Deafferentation on Cardiovascular Responses in Rats Exposed to HBO2

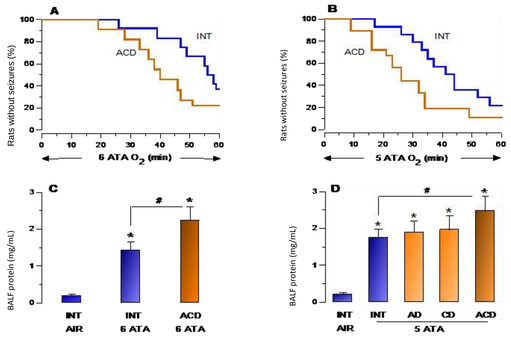


Electrical Stimulation of Aortic Depressor Nerve Preserves Hypertension (A), Tachycardia (B) and Sympathetic Excitation (C)

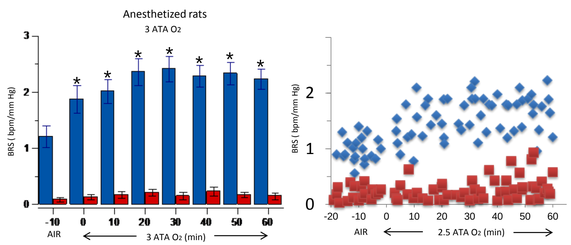
Conclusions

Physiological activation of the arterial baroreflex during HBO_2 has two protective function:

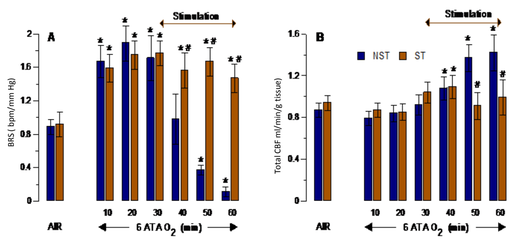
- It limits convective delivery of toxic doses of oxygen to the brain
- It restrains brain excitability, preventing the development of CNS and pulmonary HBO_2 toxicity



Baroreceptor Deafferentation Shortened Seizure Latency (A, B) and Increased Lung Injury in Rats Exposed to HBO2



Moderate Hyperbaric Hyperoxia Improves Baroreflex Function by Baroreceptor Afferents Activation



Electrical Stimulation of Aortic Depressor Nerve Preserves Baroreflex Function (A) and Cerebral Hyperemia (B)

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