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## Traumatic Brain Injury

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## Effects of hyperbaric oxygenation therapy on cerebral metabolism and intracranial pressure in severely brain injured patients.

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**OBJECT:** Hyperbaric oxygenation (HBO) therapy has been shown to reduce mortality by 50% in a prospective randomized trial of severely brain injured patients conducted at the authors' institution. The purpose of the present study was to determine the effects of HBO on cerebral blood flow (CBF), cerebral metabolism, and intracranial pressure (ICP), and to determine the optimal HBO treatment paradigm. **METHODS:** Oxygen (100% O<sub>2</sub>, 1.5 atm absolute) was delivered to 37 patients in a hyperbaric chamber for 60 minutes every 24 hours (maximum of seven treatments/patient). Cerebral blood flow, arteriovenous oxygen difference (AVDO<sub>2</sub>), cerebral metabolic rate of oxygen (CMRO<sub>2</sub>), ventricular cerebrospinal fluid (CSF) lactate, and ICP values were obtained 1 hour before and 1 hour and 6 hours after a session in an HBO chamber. Patients were assigned to one of three categories according to whether they had reduced, normal, or raised CBF before HBO. In patients in whom CBF levels were reduced before HBO sessions, both CBF and CMRO<sub>2</sub> levels were raised 1 hour and 6 hours after HBO ( $p < 0.05$ ). In patients in whom CBF levels were normal before HBO sessions, both CBF and CMRO<sub>2</sub> levels were increased at 1 hour ( $p < 0.05$ ), but were decreased by 6 hours after HBO. Cerebral blood flow was reduced 1 hour and 6 hours after HBO ( $p < 0.05$ ), but CMRO<sub>2</sub> was unchanged in patients who had exhibited a raised CBF before an HBO session. In all patients AVDO<sub>2</sub> remained constant both before and after HBO. Levels of CSF lactate were consistently decreased 1 hour and 6 hours after HBO, regardless of the patient's CBF category before undergoing HBO ( $p < 0.05$ ). Intracranial pressure values higher than 15 mm Hg before HBO were decreased 1 hour and 6 hours after HBO ( $p < 0.05$ ). The effects of each HBO treatment did not last until the next session in the hyperbaric chamber. **CONCLUSIONS:** The increased CMRO<sub>2</sub> and decreased CSF lactate levels after treatment indicate that HBO may improve aerobic metabolism in severely brain injured patients. This is the first study to demonstrate a prolonged effect of HBO treatment on CBF and cerebral metabolism. On the basis of their data the authors assert that shorter, more frequent exposure to HBO may optimize treatment.

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