

**Medical Studies:  
Proven Effectiveness and Safety of HBOT for Stroke**

**Jain, K.K. Chapter 17: Role of HBO in the Management of Stroke.” Pp 227-252; in Textbook of Hyperbaric Medicine, 1990**

HBO should be started in the acute phase of a stroke as an adjunct to conventional medical management. Sometimes or often there is no improvement with conventional medical management and physical therapy. Animal studies and uncontrolled human trials have shown the effectiveness and safety of HBO after stroke. Evaluation of patients during an HBO session have revealed response rates of 100% (improvement of spasticity or motor power or both). Improvement may be initially transient but can be maintained following daily treatments 1.5 ATA for 45 minutes for 6 weeks.

**Jain, K.K. Effect of HBO on Spasticity in Stroke Patients. J Hyperbaric Med, 1989; 4(2): 55-61**

#21 post-stroke patients

HBO 1.5 ATA / supplemental oxygen / 45 min session

100% response to HBO

- decreased spasticity
- but transient / lasting on 24 hours
- HBO effects were more marked than PT

Continued HBO and PT results were maintained after 5 weeks of therapy (#30)

**Marroni, A. et al. “Hyperbaric Oxygen Therapy at 1.5 or 2.0 ATA as an adjunct to the Rehabilitation of Stabilized Stroke Patients. A controlled study.” Proceedings of the 9<sup>th</sup> International Congress on Hyperbaric Medicine, March 1-4, 1987; Sydney, Australia, pp 161-167**

#80 patients chronic stroke; average of 59 months / 5 years

HBO 1.5 and 2.0 ATA 30 sessions

Similar improvement

Benefits maintained at 3 months.

**Neubauer, R.A et al. “Cerebral oxygenation and the recoverable brain.”**

**Neurology Research, 20 suppl 1: S33-6, 1998**

HBO can result in permanent improvement in blood flow and tissue metabolism. Recoverable brain tissue can be identified with SPECT imaging and HBO.

**Neubauer, R.A. et al. “HBO and Imaging Techniques in Diagnosis and Therapy of Stroke. Does the Ischemic Penumbra Alter the Outcome in Stroke?” International Symposium: Neuropsychomotor, Neuro-Pharmacological, Psychosocial and Ethical Aspects, Oct 7-11, 1992**

Recovery of stroke is more related to the oxygen content than to blood flow.

SPECT can demonstrate ischemic penumbras.

SPECT before and after HBO 1.5 ATA for 60 minutes

#15 patients post stroke - 6 hour to 15 years

Significant and marked changes in flow and metabolism were observed in ALL 15 patients.

**Neubauer, R.A. et al.” Enhancing idling neurons.” Letter. The Lancet, March 3, 1990; 542.**

After HBO there was a sharp increase in tracer uptake in areas showing hypometabolism on the pre-HBO study ... Reduced spasticity, improved ambulation and speech, and cessation of drooling were noted.”

**Neubauer, R.A. “Generalized small-vessel stenosis in the brain. A case history of a patient treated with HBO at 1.5 to 2 ATA.”**

**Minerva Medical, 1983; 74:2051-2055**

Small cerebral blood vessel disease

Initial presentation – gross mental confusion, memory loss, irrational speech, and occasional violence.

HBO therapy  
Good response – well functioning patient  
Intermittent HBO \* 4 years  
Acute stroke, total disorientation and confusion  
HBO – regained function

**Neubauer, R.A. et al. “HBO as an Adjunct Therapy in Strokes due to Thrombosis.” STROKE, 1980; 11(3): 297-300**

122 patients who had an improved response with conventional and HBO as compared to conventional alone.

**Nighohossian, N et al. “Hyperbaric Oxygen in the Treatment of Acute Ischemic Stroke. Double-blind pilot study.” STROKE, 1995; 26:1369-1372**

#34 patients – acute stroke – middle cerebral artery occlusion  
HBO 1.5 ATA 40 minutes \* 10 treatments or HBO with air  
17 in each group  
27 completed the full study of 1 year of observation  
Conclusion

HBO is safe – none of the major side effects of HBO were observed while using lower pressure.  
No significant improvement difference in the groups at 1 year,  
They detected an outcome trend favoring HBO therapy.

**Neuroscience, Behaviour, and Physiology 1985; 15: 13-16**

#104 patients with cerebrovascular disease or decreased brain circulation

#72 transient  
#32 chronic

**Results**

72% good / positive  
20% satisfactory / moderate  
6% no response

1. 72% had a good response

2. Observation over 3-5 years of patients receiving HBO every 6 months supports use HBO as a preventive therapy.

**Stroke, 1971; 2: 247-250**

Patient with a R Middle Cerebral Artery occlusion  
HBO 2.5 ATM \* 15 days + drug therapy (methyl dopa, hydrochlorothiazide)  
Significant improvement noted  
Rest period \* 30 days – to assess for spontaneous (natural healing) remission  
No further improvement noted  
HBO restarted  
Response – return to near normal  
1. dramatic response to HBO after acute stroke

**Proceedings of the 6<sup>th</sup> International Congress on Hyperbaric Medicine – 1979**

Deteriorations in brain function can be improved by HBO therapy in the acute and chronic post-stroke stage

**Reversibility of the Chronic Post-Stroke State**

**STROKE, 1976; 7(3): 296-300**

#40 stroke patients - #20 early post-stroke stage and #20 chronic  
HBO therapy and EEG analysis and neurological assessment  
27% considerable / dramatic improvement  
53% moderate improvement

