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.


#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 9th 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.


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.


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.

#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 (methyldopa, 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 6th 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
20% no change
1. more than 75% benefited
2. more than 25% improved close to normal function

...Reversible and Irreversible Post-stroke Changes in Brain Tissue...
Surgical Neurology, 1977; 7: 325-331
35# chronic stroke
internal carotid blockages
prominent neurological deficit persisting for average of 10 weeks
Group 1 15 significant improvement at the end of HBO
Vascular surgery and more improvement
Group 2 15 no significant improvement after HBO
No surgery
Group 3 5 no significant improvement after HBO
Vascular surgery performed but no improvement

#22 post-stroke patients
HBO 1.5 ATA
10 patients had improvement

Circulation, Suppl 2: May, 1996; 20-27
Acute cerebral vascular deficits from cerebral embolism, thrombosis, hemorrhage, arteriographic complications.

#22 patients
4 good / dramatic response – lasting
8 response was temporary
12 no response

Recommended Protocol
Pressure Mild / 1.3 Atmospheres
Time 45-60 minutes
Treatment 20
Frequency: recommended 5 days per week
minimum 3 day MWF per week
Rest 1-2 weeks
Repeat 20 session cycle 1-2x

Available for home use under the care and prescription of a physician

Benefits reported by patients
Improved sleep Increased energy and endurance
Awakened refreshed General well-being
Improves thinking Improves memory
Improves interaction Reduces spasticity
Improves ambulation and speech Decreases drooling

** Most patients report benefits within 5 treatment sessions