Montreal — Pediatric obstructive sleep apnea may have lifelong physiologic and cognitive consequences even after it is successfully treated, according to Dr. David Gozal, professor of pediatrics at the University of Louisville (Ky.).

“Children have a plastic system, and as such, they can be conditioned to develop differently than they would oth- erwise if they were not perturbed by sleep-disordered breathing during their childhood,” he said at the Eighth World Congress on Sleep Apnea. “It is our duty to start identifying this condition very early and to identify those children at risk for consequences later in life.”

Dr. Gozal suggests that sleep apnea may be a childhood antecedent of adult cardiovascular disease in genetically susceptible individuals. His study in 26 nonobese children with obstructive sleep apnea demonstrated the presence of endothelial dysfunction, compared with controls in response to cuff occlusion applied for 30 seconds to the brachial artery and then released.

“Reperfusion was slow and sluggish in those with sleep apnea, compared to control children,” he said. With ef- fective treatment of their sleep apnea, 18 of the 26 chil-
dren normalized to the reperfusion rate of controls.

However, in eight children there was no change in reperfusion rate despite complete resolution of obstructive sleep apnea for 6 months. “This can be used as a special burden—they had very strong family histories of cardiovascular disease. It might be that, if you have sleep apnea and you have a genetic suscep- tibility to anorxia, the sleep apnea could trigger the onset of a disease to which you are predis- posed genetically or it could accelerate the process,” he suggested.

Other research by Dr. Gozal and his colleagues has shown that even with treatment, sleep-disordered breathing in early childhood is as- sociated with behavioral and academic problems in mid- dle school. His study of more than 1,500 middle school students found that those in the bottom 25th per- centile of academic performance were three times more likely to develop sleep-disordered breathing in early childhood for snoring, compared with students in the top 25th percentile. The rate of adenosinestimulatory for recurrent infection was the same in both groups (Pedi- atrics 2001;107:1394-9).

Hyperbaric Oxygen Benefits Children With Brain Injury

BY DAMIAN McNAMARA
Montreal Bureau

FORT LAUDERDALE, Fla. — Hyperbaric oxygen therapy improves cognitive and social function in children with chron- ic brain injury, according to a study pre- sented at a symposium on hyperbaric oxygen therapy.

Daily living, socialization, communica- tion, and motor skills significantly im- proved for 21 children treated with hyper- baric oxygen therapy (HBOT), compared with 21 brain-injured patients who received standard therapy. Researchers included a third group of 21 healthy children to control for normal growth and development, reported Dr. Charles J. Golden at the sym- posium sponsored by the Ocean Hyperbaric Neurologic Center.

All participants were assessed more than 1 year after onset of their chronic brain in- jury. The majority had cerebral palsy. The average age of all participants was 4.5 years (range, 12 months to 18 years), said Dr. Golden, professor of psychology and di- rector, Neuropsychology Assessment Cen- ter, Nova Southeastern University, Fort Lauderdale, Fla.

Average functioning level was close to two standard deviations below average—“so this was a very low functioning group,” he added.

Mild changes in some areas but no changes in the cerebellum were noted af- ter 35 HBOT sessions, compared with baseline, Dr. Golden said. “This is not un- expected. These children have injuries high up in the brain.”

“Unimaginably, you can predict reasonably well who will be a responder based on re- sponse over the first 35 treatments,” he said. “Some people are just nonrespon- ders—you can give them 200 treatments, and they will not respond. Others are mar- velous responders who respond well and right away.”

After a second round of 35 HBOT treat- ments, “there was a much greater effect on blood flow…so it seems to be a time-based effect,” Dr. Golden said.

The HBOT group made major changes in all areas that were greater than either the normal or standard therapy control groups.

“This is a group who is at the end—they have failed multiple therapies. And still we have about 70% who respond [to HBOT],” said Dr. Golden. “The plasticity of the brain may be much greater than we imag- ined. HBOT may stimulate ability of the brain to reorganize itself.”

Dr. Golden and his associates used the Vineland Adaptive Behavior Scales to rate basic adaptive, motor, and cognitive abilities “This can be used without a child having to perform for us, which is challenging with cerebral palsy,” he said.

They assessed blood flow changes with a series of three single-photon emission computed tomography (SPECT) scans be- fore, during, and after HBOT treatment. They assessed the cerebellum, pons, right and left hemisphere subcortical areas, and the cortical region.

Families were highly motivated to see changes, a possible limitation of the study, Dr. Golden said. In addition, the study was not double-blind, and the sample was small compared with baseline. Dr. Golden said, “If you lose some IQ points and you are male, you may run the risk of never recovering. Given the theory that estrogen provides neuroprotection, there is some bio- logical plausibility for these findings,” he said in an interview.

Despite his studies showing evi- dence of residual consequences even after treatment of childhood apnea, other research by Dr. Gozal suggests that early treatment may have the po- tential to completely reverse such consequences.

“Children ‘can be conditioned to develop differently than they would otherwise if they were not perturbed by sleep-disordered breathing.’

This tells us that sleep-disordered breathing is associ- ated with neurocognitive morbidity, which is partially irre- versible,” he said.

“If you have an IQ of 90 points and you are male, you may run the risk of never recovering. Given the theory that estrogen provides neuroprotection, there is some bio- logical plausibility for these findings,” he said in an interview.

Despite his studies showing evi- dence of residual consequences even after treatment of childhood apnea, other research by Dr. Gozal suggests that early treatment may have the po- tential to completely reverse such consequences.

“Children have a plastic system, and as such, they can be conditioned to develop differently than they would oth- erwise if they were not perturbed by sleep-disordered breathing during their childhood,” he said at the Eighth World Congress on Sleep Apnea. “It is our duty to start identifying this condition very early and to identify those children at risk for consequences later in life.”

Dr. Gozal suggests that sleep apnea may be a childhood antecedent of adult cardiovascular disease in genetically susceptible individuals. His study in 26 nonobese children with obstructive sleep apnea demonstrated the presence of endothelial dysfunction, compared with controls in response to cuff occlusion applied for 30 seconds to the brachial artery and then released.

“Reperfusion was slow and sluggish in those with sleep apnea, compared to control children,” he said. With ef- fective treatment of their sleep apnea, 18 of the 26 chil-
dren normalized to the reperfusion rate of controls.

However, in eight children there was no change in reperfusion rate despite complete resolution of obstructive sleep apnea for 6 months. “Children have a special burden—they had very strong family histories of cardiovascular disease. It might be that, if you have sleep apnea and you have a genetic suscep- tibility to anorxia, the sleep apnea could trigger the onset of a disease to which you are predis- posed genetically or it could accelerate the process,” he suggested.

Other research by Dr. Gozal and his colleagues has shown that even with treatment, sleep-disordered breathing in early childhood is as- sociated with behavioral and academic problems in mid- dle school. His study of more than 1,500 middle school students found that those in the bottom 25th per- centile of academic performance were three times more likely to develop sleep-disordered breathing in early childhood for snoring, compared with students in the top 25th percentile. The rate of adenosinestimulatory for recurrent infection was the same in both groups (Pedi- atrics 2001;107:1394-9).

This is that we do not know how long the disease was there before it was treated. Therefore, in the current context of late referral, it is likely that residual deficits will re- main. However, it is also likely that with early diagnos- is and intervention these residual deficits can be pre- vented,” he said.

Dr. Gozal disclosed that he has various speaking, con- sultancy, or grant arrangements with Merck & Co., As- trazeneca Pharmaceuticals, and Iitamar Medical Ltd.

Hyperbaric Oxygen May Lead to Improved Cognition in Cerebral Palsy

BY DAMIAN McNAMARA
Miami Bureau

FORT LAUDERDALE, Fla. — Ad- junctive hyperbaric oxygen therapy sig- nificantly improves cognition for chil- dren with cerebral palsy, compared with standard therapy alone, according to an open, ongoing, observational study.

All participants significantly im- proved their physical, speech, and mo- tor capabilities after 6 months, com- pared with baseline. Interim results for 84 children whose parents chose hy- perbaric oxygen therapy (HBOT) and 20 children in a non-HBOT group were presented at a symposium on hyper- baric oxygen therapy.

Changes in cognition were distinc- tive. “Children receiving HBOT showed statistically significant improvements in cognitive-only parameters. This is in- teresting and what is driving us to go on with this treatment,” said Dr. Arun Mukherjee of Majedea Hospital, New Delhi, India.

Researchers used a modified 49-item Gross Motor Function Measure to monitor clinical progress at 2-month in- tervals. In an attempt to assess the ef- fects of hyperbaric oxygenation, re- searchers focused on 26 cognitive-only items, which are less dependent on therapist input. “This is the closest measure we can get to brain repair,” said Dr. Mukherjee, who is also direc- tor of the UDAAN Project for Cerebral Palsy at the Foundation for Spastic and Mentally Handicapped Persons in New Delhi.

UDAAN is a Hindi word for flight (of freedom).

Hyperbaric therapy consisted of 1.3 atmos- pheres. Not included in this interim analy- sis is a recently added third group of patients who receive a low-pressure HBOT option (ambient air delivered at 1.3 atmospheres).

Dr. Mukherjee and his associates launched the UDAAN HBOT-Based Multimode Long-Term Observational Study in 2001 to assess the benefits, if any, of adjunctive therapy for children with cerebral palsy. They tried nerve block with Botox and phenol, comput- er-assisted biofeedback, and pulsed magnetic field therapy. “We were not impressed with their cost-to-benefit ra- tio as per Indian prices. Hence, we have dropped them.”

Standard therapy consists of special education, occupational therapy, speech therapy, and physiotherapy to- taling 2 hours daily. After 5 months of HBOT, clinicians administer 60 ses- sions of electroacupuncture using tran- scutaneous electrical nerve stimulation (TENS) specifically designed for cere- bral palsy. This therapy reduces pain and discomfort of intensive exercises and helps the brain recognize path- ways revived by HBOT. Dr. Mukherjee said at the symposium sponsored by the Ocean Hyperbaric Neurologic Cen- ter in Fort Lauderdale, Fla. “This alerts the brain that these circuits are now working,” he said.

Short-term treatment has limited other pediatric studies of hyperbaric oxygen for cerebral palsy. Dr. Mukher- jee said. In the current investigation, it took 6 months before cognitive differ- ences between groups reached statis- tical significance. This suggests the need for a long-term commitment to hyper- baric therapy for cerebral palsy.