

tion of the detrusor muscle. These patients may have improved vesical function following stimulation and dibucaine blocks of S2, S3 and S4 roots on the side showing the poor response to stimulation. **Summary:** Percutaneous stimulation of the sacral nerve roots is relatively simple and since the results may be quite valuable in indicating therapy, we feel the technique warrants more interest and further study.

The Effect of Ventilation and Acetazolamide (Diamox) on Cerebral Blood Flow in Chronic Respiratory Acidosis. J. LEE, M.D., S. COTEV, M.D., J. W. SEVERINGHAUS, M.D., and M. M. SINGER, M.D., *Department of Anesthesia and Cardiovascular Research Institute, University of California Medical Center, San Francisco, Calif.* Patients with chronic respiratory acidosis and compensating metabolic alkalosis have elevated HCO_3^- concentrations in cerebrospinal fluid. The results of rapid restoration of normal PCO_2 in such patients may be delirium, generalized twitching, convulsion and coma (Rotherham, E. B., Jr., Safar, R., and Robin, E. D.: J.A.M.A. 189: 993, 1964). These clinical manifestations may relate to the low cerebral blood flow associated with extreme alkalosis in brain extracellular fluid and cerebrospinal fluid when PCO_2 is lowered toward normal. The correction of metabolic alkalosis and reduction of cerebrospinal fluid HCO_3^- to normal do not occur rapidly because renal compensation is very slow. We are studying the use of combined artificial ventilation and administration of a carbonic anhydrase inhibitor, acetazolamide, for treatment of these patients. The drug is known to reduce plasma HCO_3^- rapidly. It appears to facilitate the reduction of cerebrospinal fluid HCO_3^- , after correcting the hypercapnia, and to increase cerebral blood flow. Readjustment of cerebrospinal fluid pH resets the medullary respiratory chemoreceptor to normal pH at normal PCO_2 . **Methods:** Patients with chronic lung disease were studied in the Intensive Care Unit. Control values for serum electrolytes, arterial and jugular venous pH, PCO_2 and PO_2 and saturation, and lumbar cerebrospinal fluid pH, PCO_2 , lactate, and electrolytes were determined after the patient had established a steady state with a nasotracheal tube, arterial catheter, and a jugular

bulb needle inserted. The measurements were repeated at intervals during: 1. Spontaneous respiration of high concentrations of oxygen. 2. Hyperventilation in air to normal or lower than normal PCO_2 . 3. Hyperventilation (as in 2) after administration of 500 mg. acetazolamide intravenously. Cerebral blood flow changes from control were estimated from the arterial-jugular O_2 saturation differences and in some patients were measured by a washout modification of the Kety N_2O technique. **Results:** In six subjects:

Respiration	No. Subjects	PaCO_2 mm Hg	$\text{S}_{(\text{A-V})}\text{O}_2$ vol. %
Air-spont.	6	56.4	6.4
O ₂ -spont.	4	70.5	2.8
Air-artificial	4	33.8	10.7
Air-art.-Diamox	4	36.7	5.3

One subject lost consciousness when his arterial PCO_2 was reduced from 59 mm Hg to 36 mm Hg in one hour and 10 minutes; he regained consciousness 15 minutes after receiving 500 mg Diamox intravenously, in spite of hyperventilation. Follow-up arterial blood gas determinations were done 12 to 24 hours following the study in the hospital, and again in the outpatient department after the patient was discharged. Restoration of the normal chemoreceptor drive to respiration may decrease morbidity and may improve the patient's response to subsequent increase in arterial PCO_2 . Preliminary averages of arteriovenous O_2 differences after Diamox suggest that a prompt normalization of cerebral blood flow occurred. The effect of hyperventilation and Diamox on cerebral oxygen and glucose consumption is being studied. (Supported in part by USPHS Grants GM 00063 and HE 06285.)

Blood Volume and Circulatory Measurements during Extreme Acute Hemodulation. EDWARD LOWENSTEIN, M.D., ANDRZEJ MICHALSKI, M.D., and MYRON B. LAVER, M.D., *Harvard Medical School at Massachusetts General Hospital, Boston, Mass.* The purpose of these studies is to define the limits of blood volume replacement by physiologic saline solution (Hartman's Ringer's lactate) in acute sustained hemorrhage, in normal dogs and in dogs with a surgically-created right-to-left shunt (approximately 66 per cent) (Michalski and Winter: J. Appl. Physiol. 22: 1020, 1967). **Proto-**