

fers from that observed in awake animals, on the one hand, and from that observed in animals under chemical anesthesia on the other hand. A reversal of blood flow in pial vessels was observed in cats after application of electroanesthesia also. Another report claimed that stimulation of certain brain areas with external or implanted electrodes can be used for the treatment of intractable pain. Depression of mood also could be influenced by the choice of polarity of the bipolar electrodes used in such techniques, although marked individual differences in sensitivity and intensity of reaction were observed. While these behavioral alterations have been substantiated by psychiatrists and psychologists, the consensus was that lack of predictability and individual variation hinder broad clinical application of these techniques as therapeutic tools.

Observations were reported on the use of electroanesthesia and electrosleep in the Soviet Union, including a case in which a middle-aged woman with myasthenia gravis had a thymectomy under electroanesthesia of the interfering-frequency type following induction with thiopental and *d*-tubocurarine. Significant criticism and doubts were expressed concerning the effects of this type of electroanesthesia. It was also reported that in the Soviet Union so-called electrotherapeutic sleep has been in use for about 20 years in the treatment of a wide variety of disorders, primarily psychosomatic in nature, including insomnia, anxiety syndromes, and even specific diseases of the central nervous system. The technique consists of the use of minute currents which are sent through the brain from electrodes placed on the eyes and upon the nape of the neck. The treatments last from 30 to 90 minutes and may be repeated as many as 25 times. There are reportedly 300 electrosleep stations within the Soviet Union, and the popularity of this method of treatment is said to be increasing constantly. The current employed does not, however, always produce sleep at the time of treatment. In fact, only about one-third of the subjects fall asleep during therapy whether the current is turned on or not, and therapeutic effect cannot be related to induction of sleep. The term "electrosleep" is, therefore, a misnomer. The inves-

tigators using these techniques are convinced, nevertheless, that electrotherapeutic sleep is an effective method of treatment of hypertension, peptic ulcers, and other psychosomatic disorders. Soviet investigators believe they have excluded the possibility that the benefits of electrotherapy are produced by suggestion alone. It is suggested that further clinical observations must be made to substantiate the claims of the Soviet scientists.

The diversity of specialties represented by the 205 participants attending the meeting (including 26 biophysical scientists, 15 anesthesiologists, 9 psychiatrists and psychologists, 11 physiologists, 7 neurologists, etc.) demonstrates the need for such a meeting. The formation of an American Neuroelectrical Society is a logical step.

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Conference on Respiratory Therapy

The annual conference on Respiratory Therapy, sponsored by the Departments of Respiratory Therapy of the Children's Hospital Medical Center, New England Deaconess Hospital, and Lahey Clinic Foundation, was held at the Statler-Hilton Hotel, Boston, Massachusetts, November 9-11. Nineteen talks were given in three subject groups: (1) pulmonary anatomy, physiology, pathology, and bacteriology as related to respiratory therapy; (2) the management of patients in respiratory failure from pulmonary and neurologic disease; (3) the training of personnel in, and practical application of, physical therapy of the chest and respiratory (inhalation) therapy.

M. J. Nicholson (Lahey Clinic Foundation) emphasized in his opening remarks the desirability of cross fertilization of ideas from the various medical specialties and basic science fields in order to increase our understanding of respiratory physiology and to improve the quality of respiratory therapy. This objective was well realized in three exciting talks delivered by an anatomist, a pathologist, and an anesthesiologist—V. E. Krahl (University of Maryland), G. Nash (Harvard Medical School), and H. Pontoppidan (Harvard Medical School), respectively. Dr. Krahl, in an

excellent review of the anatomy of the lung, emphasized the potential importance of the interstitial space between the basement membranes of the alveolar epithelial cells and pulmonary capillary endothelial cells. This interstitial space normally contains connective tissue elements which may proliferate in disease.

Nash discussed his findings at necropsies of patients who had undergone artificial ventilation with 90 to 100 per cent oxygen for periods of three days or more. The major findings were increase in lung weight (more than 1,800 grams in half the patients), and, microscopically, the appearance of hyaline membranes. Most importantly, interstitial edema and fibrosis were found in one-third of the study group. Dr. Nash described an early exudative phase characterized by interstitial edema and intra-alveolar edema and hemorrhage, beginning after about three days' exposure in man, followed by a later proliferative phase characterized by interstitial edema and early fibrosis. He emphasized that the lesions are nonspecific and may be reversible, unlike classical interstitial fibrosis of the lung. These pathologic changes are associated with artificial ventilation and high partial pressures of oxygen, but not with the duration of ventilation. Increase in the thickness of the interstitial fluid layer between alveolar epithelial cells and capillary endothelial cells was illustrated in electron micrographs of the alveolar wall of a rat exposed to high partial pressures of oxygen.

Pontoppidan discussed the stiff lung, including recent work by A. Sladen. He emphasized the role of positive water balance in the production of the "stiff lung syndrome," a syndrome defined as progressively fall in compliance during artificial ventilation, associated with diffuse haziness on the chest X-ray and increasing difficulty in ventilation and oxygenation, which require progressively larger tidal volumes and airway pressures in the absence of clinical cardiac failure or pulmonary infection. Edema, increase in body weight and alveolar-arterial oxygen tension gradient, and decrease in vital capacity, compliance, hematocrit, and serum sodium concentration were found in 19 of 100 patients undergoing artificial ventilation. These abnormalities were all reversed with diuretic therapy.

In addition to the interesting reports of Drs. Krah, Nash, and Pontoppidan, M. Stein (Brown University), opening the section on clinical problems, pointed out the rapid increase in reported deaths from chronic lung disease, from 3,000 in 1950 to 26,000 in 1965. He also emphasized that improvement in diagnosis and treatment of respiratory failure has yielded a spectrum of complications which we must become more proficient in managing: gastrointestinal bleeding, cardiac arrhythmias, tracheal complications, "gas toxicity," and central nervous system abnormalities.

H. B. Fairley (University of Toronto) stated that in addition to the now-traditional methods of diagnosis of respiratory failure, namely, spirometry and measurement of arterial gases, one needs to ask two further questions: (1) is adequate ventilatory reserve available to meet the added work of breathing required by increase in airway and tissue resistance and in deadspace; and (2) is ventilation required to improve oxygenation? Improved oxygenation often may be required in postoperative patients with a "clenched chest" due to pain. Such patients breathe at low functional residual capacity. Fairley agreed with Nash and Pontoppidan that, although pulmonary infection remains a major problem in the management of respiratory failure by artificial ventilation, infection may often be confused with, or indeed caused by, excessive administration of oxygen and/or water.

T. J. De Kornfeld (University of Michigan) outlined pulmonary problems associated with neurologic disease. He reported a favorable experience in the management of tetanus with curare and constant-volume ventilation, and condemned primary reliance on meprobamate or other sedatives. Ultrashort-acting barbiturates, not phenobarbital, are, however, rational in the treatment of status epilepticus. He stresses, as did others, the importance of physician-physician relationships in an intensive-care setting as being as important as the physician-patient relationship in determining whether the patient will recover.

M. Saklad (Brown University) outlined the major problems confronting those involved in the current resurgence of respiratory therapy, dividing them into human and mechanical. The human problems are: too few nurses; in-

adequately-trained respiratory therapists; lack of physicians interested in the supervision of respiratory therapy. Most physicians lack knowledge of clear indications for the use of, and understanding of the performance of, available mechanical devices. Considering mechanical problems, he stressed deficiencies in the apparatus currently available for artificial ventilation: there is presently, for example, no standardization of fittings from ventilator to patient; air dilution devices fail; too few ventilators are equipped with spirometers; tidal volume delivered by pressure-limited ventilators may be altered drastically by changes in compliance and airway resistance. Ventilators also vary markedly with regard to the "trapped volume" left within the patient (despite an airway pressure gauge reading of zero at the initiation of the next inspiration), thereby allowing patients, particularly those with increased airway resistance, to be exposed to constant positive pressure. In the face of a constant leak, the effect on minute ventilation achieved by different ventilators is quite variable.

E. J. McTernan (Northeastern University) commented on sources and incentives for the recruitment of persons into the understaffed field of respiratory therapy. In addition to the recent high school graduates, housewives seeking a second career have distinguished themselves in this field. The low rate of recruitment to respiratory therapy, as well as to other allied health vocations, is due not so much to a lack of economic and emotional rewards, which are often adequate, but rather to a lack of job mobility vertically and laterally into other fields of interest, and to low social status. The key to improvement in both these areas, he stated, is education; there is a great need for scholarship and loan funds, which currently do not exist for respiratory therapists in training. The role of the respiratory therapist might well be expanded to that of a "life-support specialist" skilled in the technical management of both cardiac and respiratory acute care.

M. Wasenius (Massachusetts General Hospital) discussed the aims of physical therapy of the chest. She emphasized that relaxation on the part of the patient decreases anxiety

and, consequently, shortness of breath. She demonstrated the correct position of the patient to decrease work of postural muscles and to allow free movement of respiratory musculature, and showed how the patient's daily activities at home may be increased greatly by adaptation of breathing in rhythm with these activities. Correct breathing exercise, primarily diaphragmatic, may improve the efficiency of ventilation. Effective coughing must be taught. Deep inspirations, a pause, and then a two-stage cough are most effective in raising secretions. If these measures are not adequate for secretion removal, bronchial drainage must be employed by positioning the patient so that the segmental bronchus is directly inferior to the segment to be drained. This may be coupled with manual assistance, *i.e.*, the cupped hand to aid in the removal of sticky secretions. Manual vibration of the chest wall during expiration by the therapist may also prove helpful.

Pulmonary rehabilitation for patients with chronic obstructive lung disease was discussed by P. Kimble (Temple University). The goals of pulmonary rehabilitation are: (1) elimination of smoking; (2) provision of good medical treatment on a continuous rather than a sporadic basis; (3) early diagnosis and treatment of exacerbations; and, (4) increase in physical activity. Success in rehabilitation (increase in amount and enjoyment of daily activity) correlates well with the initial degree of physiologic impairment and with patient motivation, but poorly with the initial level of physical activity. Many patients previously bed-bound or house-bound were able, after an average of 40 days of rehabilitation, to live enjoyable, active lives. By contrast, patients with marked alveolar hypoventilation, hypoxemia in room air, or reduction in expiratory flow rate improved little. Psychological testing scores indicate depression and anxiety in patients with emphysema far exceeding that in patients with cardiac disease, ulcer, arthritis, or asthma. Reduction in anxiety and depression, therefore, should facilitate rehabilitation.

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