

normal voice, but no signs of obstruction, (3) moderate retraction on effort, none at rest, (4) inspiratory stridor, severe sternal retraction, presumptive indication for tracheostomy, and (5) total airway obstruction. *Results:* Fifteen of 256 patients (5.5 per cent) who received placebo, and 11 of 268 patients (3.9 per cent) who received betamethasone had postoperative objective findings such as brassy cough or hoarseness. By far, most of the objective findings among patients receiving either placebo or betamethasone fell into the 0-9 year old age group, and most of the subjective complaints of soreness occurred among the adults. Thus 9.2 per cent of the children up to 10 years who received placebo, and 7.3 per cent of those receiving betamethasone had objective findings. Only one of 71 patients under one year of age fell into the 0-9 year old grouping (a patient with moderate postoperative retraction on effort who had received betamethasone). Among pediatric patients in general, most of the morbidity fell into the 1 and 2 year old, and 5 and 6 year old groups. Nineteen of 252 patients (7.0 per cent) who received placebo, and 20 of 259 patients (7.2 per cent) who received betamethasone complained of postintubation irritation or soreness. When patients 10 years old and over were evaluated, 19 of 132 patients (12.6 per cent) who received placebo, and 18 of 137 patients (11.6 per cent) who received betamethasone had subjective complaints. Application of the chi-square test to the foregoing data indicated that the differences between placebo and betamethasone were insignificant. *Conclusion:* From the results of our study to date, betamethasone does not significantly reduce postintubation morbidity from either the objective or the subjective standpoint.

Pulmonary Mechanics and Blood Gas Tensions During Anesthesia in Asthmatics.

MARTIN I. GOLD, M.D., YONG H. HAN, M.D., and MARTIN HELRICH, M.D., *Department of Anesthesiology, University of Maryland Hospital, and School of Medicine, Baltimore.* Ten asthmatics and 12 normal patients who acted as controls were studied. The asthmatics were on maintenance therapy and 5 of the 10 were in a clinical attack, the pulmonary resistance being significantly elevated. Three were in

acute status asthmaticus. All were given barbiturate-anticholinergic premedication. After insertion of an esophageal balloon and an intra-arterial needle, pulmonary compliance (C_L) and resistance (R_L) and blood gas tensions were measured, first with air and then with 50 per cent O_2 in N_2 as the inhalant. Instrumentation consisted of an esophageal balloon, transducers, pneumotachograph, an electronic recorder, a unit with O_2 and CO_2 electrodes, and a flame ionization gas chromatograph. After control measurements in the supine position, anesthesia was induced with 50 per cent O_2 in N_2O and halothane. All patients were intubated and placed on a mechanical ventilator. Arterial halothane levels were measured during maintenance. *Results:* EFFECT OF TRACHEAL INTUBATION: The three groups of patients studied were: (1) 5 during an asthmatic attack; (2) 5 asthmatics in remission; and (3) 12 nonasthmatics. All had blood halothane levels ranging from 5-10 mg. per 100 ml. during spontaneous breathing and 10-15 mg. per 100 ml. during intermittent positive-pressure breathing (IPPB). All patients were studied under three conditions: (1) awake control; (2) anesthetized, with mask; and (3) anesthetized after tracheal intubation (prior to IPPB). After tracheal intubation R_L increased and C_L decreased significantly in active asthmatics (group 1). These included 2 active asthmatics who developed bronchospasm, R_L 's being at the 35 cm. of water/liter/second level. For all groups blood gases changed in a similar manner. EFFECT OF INTERMITTENT POSITIVE-PRESSURE BREATHING (IPPB): All patients were given succinylcholine, made apneic, and placed on a ventilator. The period of IPPB varied from 15-30 minutes. After IPPB, C_L changed little. The elevated R_L in group 1 decreased during spontaneous breathing. Blood halothane levels before and after IPPB in the three groups were similar. Once again, group 2 (asthmatics in remission) and group 3 (not asthmatics) reacted similarly to the IPPB. After IPPB arterial P_{O_2} was less than before IPPB, but never lower than 100 mm. of mercury. The P_{CO_2} in all groups was high (average 50 mm. of mercury), probably because of decreased alveolar ventilation (\dot{V}_A) during spontaneous breathing. In group 1 during IPPB with a 10 liters/minute \dot{V}_A , arterial P_{CO_2}

was 35 mm. of mercury. In all groups a positive relation existed between the \dot{V}_A and the arterial blood gases. Any deterioration in blood gas phenomena could be corrected with adequate \dot{V}_A in the active asthmatic. Once again, groups 2 and 3 reacted similarly. *Conclusion:* Changes in pulmonary mechanics in asymptomatic asthmatics resembled those of nonasthmatics. Asthmatics in an attack have increased R_L and decreased C_L during spontaneous breathing. Changes in blood gases appeared directly related to changes in \dot{V}_A . When \dot{V}_A was adequate, asthmatics in both groups had normal blood gases. During an asthmatic attack tracheal intubation may increase R_L significantly, though temporarily. These patients had elevated R_L which may be significantly lowered after IPPB. This decrease in R_L corresponded to a clinical improvement during which secretions became manifest and wheezing disappeared.

Increased Cyanosis of Tetralogy of Fallot Due to Positive Pressure Respiration. J. A. GUTTIERREG, M.D., M. J. STRONG, M.D., and A. S. KEATS, M.D., *Department of Anesthesiology, Baylor University College of Medicine, Houston, Texas.* Spontaneous respiration with 100 per cent oxygen improves cyanosis of patients with cyanotic tetralogy of Fallot. Paradoxically we and others have observed an increase in cyanosis in these patients during anesthesia for palliation or correction when a high oxygen mixture was inspired. *Method:* To document this observation and to investigate its cause, arterial P_{O_2} , pH and P_{CO_2} were obtained in 15 patients during total surgical correction of the tetralogy of Fallot. Arterial blood samples were drawn from an indwelling intra-arterial needle, usually the radial artery. Arterial blood was sampled at four periods: (1) spontaneous respiration with room air, (2) spontaneous respiration with 100 per cent oxygen, (3) controlled respiration (+5 to +15 cm. of water) with 0.5 per cent halothane in oxygen with pleura closed, and (4) controlled respiration (+5h +0-) with 0.5 per cent halothane in oxygen and pleura open. *Results:* The mean $P_{a_{O_2}}$ values of these patients showed the expected increase from 56.5 mm. of mercury to 90 mm. of mercury during spontaneous respiration with 100 per

cent oxygen compared to room air. Only a moderate further increase in $P_{a_{O_2}}$ to 99 mm. of mercury was observed after respiration was controlled with 100 per cent oxygen for five minutes. Once the pleural space was opened, positive pressure ventilation resulted in a decrease in $P_{a_{O_2}}$ from 99 mm. with the pleura closed to 68 mm. with pleura open. Since the decrease in $P_{a_{O_2}}$ may have been secondary to intrapulmonary shunting known to occur during anesthesia, especially open chest, identical determinations were made on 5 patients, during surgical correction of isolated ventricular septal defect. Patient's with ventricular septal defect were operated upon under identical circumstances of anesthesia, position during operation, degree of hyperventilation and positive pressure respiration. In no patient did $P_{a_{O_2}}$ fall during controlled respiration with positive pressure. Periodic hyperinflation of the lungs with pleura open did not alter $P_{a_{O_2}}$ in patient's with ventricular septal defect during the degree of hyperventilation imposed. *Conclusion:* An increase in cyanosis and a decrease in $P_{a_{O_2}}$ occurred in patients with tetralogy of Fallot when the pleura was opened despite continued hyperventilation with 100 per cent O_2 and without visible atelectasis or arterial hypotension. We postulate that the loss of the normal "negative" intrapleural pressure combined with positive pressure ventilation increased pulmonary vascular resistance. This elevated pulmonary vascular resistance led to an increase in the right to left shunt through the V.S.D. and increased cyanosis.

Effect of Body Temperature on Anesthetic Blood Levels of Halothane in Man. YONG H. HAN, M.D., and MARTIN HELRICH, M.D., *Department of Anesthesiology, University of Maryland, School of Medicine, Baltimore Maryland.* It has been known for some time that the lower the body temperature, the less the concentration of anesthetic agent required for anesthesia (Snow, J.: *London Med. Gaz.* 41: 1074, 1848; Hebert, C. L., and others: *Anesth. Analg.* 36: 24, 1957). On the other hand, the solubility of a gas in aqueous media increases with decreasing temperature of the media (Haggard, H. W.: *J. Biol. Chem.* 55: 131, 1923; Eger, E. I., and Larson, C. P., Jr.: *Brit. J. Anesth.* 36: 140, 1964). This investiga-