

Literature Briefs

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Literature Briefs were submitted by Drs. C. M. Ballinger, R. B. Boettner, A. Boutros, D. R. Buechel, R. B. Clark, M. I. Gold, W. H. Mannheim, D. Morrow, J. W. Pender, L. J. Saldman, A. D. Sessler. Briefs appearing elsewhere in this issue are part of this column.

Circulation

CATECHOLAMINE MECHANISM The effects of cyclic AMP and its dibutyryl derivative on the isolated cat papillary muscle preparation were studied. Because of inability to enter cells rapidly, cyclic AMP had no effect on the contractile behavior of papillary muscle, while the dibutyryl derivative increased both isometric tension and the rate of tension development. The effects of the derivative on papillary muscle were indistinguishable from those of norepinephrine, except that propranolol blocks the effects of norepinephrine and not those of the derivative. The dibutyryl derivative of cyclic AMP combines increased lipid solubility with resistance to degradation while mimicking the biological effects of cyclic AMP. This study provides further evidence that the positive inotropic response to catecholamines is mediated by an increase in the intracellular level of cyclic AMP. (Skelton, C. L., and others: *Positive Inotropic Effects of Dibutyryl Cyclic Adenosine 3', 5'-Monophosphate*, *Circ. Res.* 26: 35 (Jan.) 1970.)

CARDIAC WORK IN HYPOXIA The effects of three levels of steady-state work during steady-state breathing of 12 and 21 per cent oxygen were studied in 28 human volunteers using radioisotopic techniques to measure cardiac output and coronary blood flow. At a given level of oxygenation, coronary blood flow correlates well with cardiac work. When arterial oxygen content was low, relatively more coronary blood flow was necessary per unit of cardiac work. The correlation between

external work and cardiac work was poor since cardiac efficiency varied from patient to patient. (Johnson, P. C., and others: *Cardiac Output and Coronary Blood Flow in Steady State Exercise during Steady State Hypoxia*, *Aerospace Med.* 41: 12 (Jan.) 1970.)

MYOCARDIAL METABOLISM The electrolytic and metabolic responses to operation and whole-body perfusion for correction of congenital cardiac defects were studied in nine children. Whole-body metabolism did not differ in cyanotic and noncyanotic patients, but in the cyanotic group the myocardium tolerated periods of aortic clamping with less anaerobic glycolysis, compared with considerable lactate production during perfusion and anoxic asystole in the noncyanotic group. More severe ketosis developed postoperatively in children than in adults. The increase in serum insulin from the glucose load of the priming solution was greater in children than in adults. In spite of the availability of adequate glucose predominantly lipid was metabolized by the body for energy, as in starvation and stress. Nonesterified fatty acids continued to be the major myocardial energy-producing substrate, although lactate, ketone bodies, and pyruvate were also extracted. (Moffitt, E. A., and others: *Myocardial Metabolism in Children Having Open-heart Surgery*, *J.A.M.A.* 211: 1518 (March) 1970.)

PULMONARY EMBOLISM 126 patients who had fractures of the pelvis, hip, and shaft of the femur were divided into two groups at random and studied for incidence of pulmonary embolism. One group (49 patients) received 6 per cent dextran 70 in saline solution. The other group (77 patients) served as the control and received equivalent amounts of saline or lactated Ringer's solution. Dextran was given as follows: 200 ml during operation, 300 ml in the subsequent six to eight hours,

500 ml daily for three days, and 500 ml every other day until ambulation or discharge. Positive diagnosis of pulmonary embolism was made only if confirmed at autopsy or if supported by positive lung scans. There were eight confirmed and four unconfirmed but clinically suspected instances of pulmonary embolism in the control group within a month of operation. Only one documented pulmonary embolism, seven weeks after operation and five weeks after discharge, occurred in the treated group. Total platelet count increased by 35 per cent in the control group and remained unchanged in the treated group. Platelet adhesiveness increased 13 per cent in the control group and decreased 31 per cent in the treated group, while plasma fibrinogen increased 13 per cent in the control group and changed little in the treated group. Although dextran was not ideal for prevention of pulmonary embolism, it was the best available agent. (Atik, M., Harkess, J. W., and Wichman, H.: *Prevention of Fatal Pulmonary Embolism, Surg. Gynec. Obstet.* 130: 403 (March) 1970.)

PULMONARY EDEMA To investigate possible mechanisms leading to high-altitude pulmonary edema, venous distensibility and forearm blood flow were measured in healthy human subjects at sea level and at an altitude of 11,800 feet. Venous distensibility decreased significantly upon going to altitude and increased toward normal when the subjects were given supplemental oxygen. Exercise at altitude accentuated the venoconstriction and simultaneously decreased forearm blood flow. The venoconstriction in subjects who developed pulmonary edema at altitude was significantly greater than that in those who did not. There is a shift of blood from peripheral veins to the central circulation in man exposed to high altitude, reaching a maximum three to four days following ascent. The delay in development of the maximum changes suggests a process of acclimatization rather than a simple and immediate response to hypoxia. The peripheral arteriolar constriction with exercise at altitude is opposite to the dilation which occurs with exercise at sea level. If the pulmonary vascular bed acts in a similarly paradoxical manner upon ascent,

then the high resistance of the arterioles may decrease, thereby increasing capillary pressure. An alternative possibility is an increase in pulmonary venular resistance with exercise, causing capillary pressure to rise. These changes, increased pulmonary blood volume, and increased capillary permeability probably all contribute to the development of pulmonary edema. (Wood, J. E., and Roy, S. B.: *The Relationship of Peripheral Venomotor Responses to High Altitude Pulmonary Edema in Man, Amer. J. Med. Sci.* 259: 56 (Jan.) 1970.)

INTERNAL JUGULAR CATHETER

The internal jugular vein was cannulated for central venous pressure measurements and transfusions in approximately 1,000 patients. With the patient in the Trendelenburg position and the head turned to one side, a no. 14 Venocath needle (with a 2-ml syringe attached) was inserted into the skin two fingerbreadths above the clavicle at the outer border of the sternomastoid muscle. The needle was directed toward the suprasternal notch and puncture of the vein wall verified by easy aspiration of dark blood. The syringe was then removed and the Venocath threaded into the vein and fixed securely to the skin. Only three complications, all nonfatal, occurred in this series. These were air embolism, thrombophlebitis due to staphylococcal cellulitis at the site of the puncture, and perforation of the vein with mediastinal infusion of electrolytes. It was felt that these complications were avoidable. (Jernigan, W. R., and others: *Use of Internal Jugular Vein for Placement of Central Venous Catheter, Surg. Gynec. Obstet.* 130: 520 (March) 1970.)

POSTOPERATIVE HYPERTENSION

Hypertension after operative correction of aortic coarctation may occur immediately after surgery and persist for about 36 hours. A delayed unexpected ("paradoxical") unexpected hypertension may appear two to three days later and last about two weeks. Much less frequently, severe abdominal pain occurs, which on occasion has led to laparotomy or has caused death from necrotizing arteritis. Eighty patients underwent operations for correction of aortic coarctation. They ranged in age from