

tion and Papaverine, *Ann. Surg.* 163: 771 (May) 1966.)

VENOUS TONE The effects of various anesthetics, such as halothane, ether, methoxy-fluorane, trichlorethylene, cyclopropane, thiopental and lidocaine, on the peripheral circulatory system were compared during passive tilting in human subjects. The blood content of the toe and the venous pressure at the ankle were measured simultaneously by means of a photoconductive plethysmography and an electromanometer. Generally, the blood content of the toe and the venous pressure at the ankle were increased more rapidly under general and epidural anesthesia with head-up tilting than under usual conditions. The change in the venous pressure preceded the change in the blood content of the toe. Furthermore, the administration of a muscle relaxant drug had no significant effect on the peripheral circulation of the lower extremities. These findings suggest that increase in venous distensibility occurred when the nervous system was blocked. (Hayashi, K.: *Clinical Studies on the Effect of Various Anesthetics on the Vascular Volume of the Human Toe, Evaluated by a Photoconductive Plethysmograph (Japanese)*, *Med. J. Hiroshima Univ.* 13: 235, 1965.)

HEMODYNAMICS OF HEMORRHAGE Hemodynamic and metabolic effects of hemorrhage were studied in 11 unanesthetized human volunteers. Hemorrhage of 15-20 per cent of the blood volume in 35 minutes produced a significant reduction in splanchnic blood volume, indocyanine green dye clearance and hematocrit. About one-half of the blood loss was contributed by the splanchnic viscera as the splanchnic blood volume was reduced by 40 per cent while the central blood volume was reduced by only 10 per cent. This hemorrhage, however, produced no significant change in splanchnic blood flow, oxygen consumption, A-V excess lactate production or in splanchnic vascular resistance. Cardiac output, heart rate, mean arterial blood pressure and arterial excess lactate were unaltered. These results suggest that the splanchnic circulation functions as an important blood reservoir which can be preferen-

tially depleted of blood in response to hemorrhage. (Price, H. L., and others: *Hemodynamic and Metabolic Effects of Hemorrhage in Man with Particular Reference to the Splanchnic Circulation*, *Circ. Res.* 28: 469 (May) 1966.)

CARDIAC SHOCK The responses to vaso-pressors in patients with acute myocardial infarction with shock were evaluated. Control measurements were cardiac output 2.2 liters/minute, mean arterial pressure (MAP) 53 mm. of mercury, systemic vascular resistance (SVR) 27 mm. of mercury/liter/minute. Methoxamine was given to seven patients. Cardiac output fell in four (19-28 per cent) and did not change in three. SVR was increased in all seven (9-212 per cent). Norepinephrine was given to 11 patients (7 of whom had received methoxamine). Cardiac output was increased in all except one (-8 per cent to +57 per cent), MAP increased in all (+3 per cent to 175 per cent). Low viscosity dextran given to two patients resulted in a 14 per cent and 54 per cent increase in cardiac output. Norepinephrine is felt to be preferable to a pure vasoconstrictor (methoxamine) in patients with cardiogenic shock. (Gunnar, R. M.: *Myocardial Infarction with Shock*, *Circulation* 33: 753 (May) 1966.)

HEMORRHAGIC SHOCK One hundred heparinized dogs, in groups of four, were bled into reservoirs until a mean systolic arterial blood pressure of 40 mm. of mercury was obtained. After 75 minutes at this blood pressure, treatment consisting of: (1) blood replacement (500-900 ml.), (2) infusion of dextran (500 ml., or (3) hydroxyethyl starch (500 ml.) was instituted in three of each four dogs. The fourth dog received no treatment. Survival rates were: blood infusion, 72 per cent; dextran infusion, 44 per cent; hydroxyethyl starch, 64 per cent; and no treatment, 20 per cent. The difference in survival between dextran and hydroxyethyl starch was not statistically significant. No adverse reactions to either dextran or hydroxyethyl starch were observed. The results indicate that hydroxyethyl starch is at least as effective as volume expanded as is clinical dextran. (Bal-

linger, W. F., and others: *The Effect of Hydroxyethyl Starch Upon Survival of Dogs Subjected to Hemorrhagic Shock, Surg. Gynec. Obstet.* 122: 33 (Jan.) 1966.)

HEMORRHAGIC SHOCK Hemorrhagic shock was produced in 24 dogs by bleeding them to a mean arterial pressure of 50 mm. of mercury and maintaining this for 2 hours. At the end of the two-hour period, the blood was returned to the dog. Twenty-one of the dogs died during the experiment or within 24 hours after its conclusion, the remaining three survived and were sacrificed after 7 days. Morphologic changes occurred in the lungs consisting of small or large areas of hemorrhagic consolidation. In the more severe cases, there was massive extravasation of red cells throughout the lung producing large confluent areas of hemorrhagic consolidation while in the less severe instances, hemorrhage was confined to some alveoli and small bronchi. In the lungs of the survivors, microscopic examination revealed the residue of hemorrhagic polymorphonuclear infiltration into the small areas of atelectasis. Changes in the lung in these dogs were as frequent as those in the heart and twice as frequent as those in the portal bed. Alterations in lung function were present but were not considered significant in determining irreversibility of the shock. This study indicates that non-fatal shock may damage the lungs and thus provide one additional source of difficulty in the post-shock period. (Sealy, W. C., and others: *Functional and Structural Changes in the Lung in Hemorrhagic Shock, Surg. Gynec. Obstet.* 122: 754 (April) 1966.)

HEMORRHAGIC SHOCK Hemorrhagic shock was produced in a series of dogs by bleeding, according to the method of Wiggers, to mean blood pressure of 30 mm. of mercury. After 60 minutes at this pressure, treatment was instituted. Of the dogs treated by reinfusion of the removed blood, 50 per cent survived. Equally good survival rates were seen if the animals were treated with: (1) the blood plus an equal amount of lactated Ringer's (pH 8.5), in a volume equal to four times the shed blood. Poorer survivals were seen if

replacement consisted of lactated Ringer's (pH 6.5) in a volume equal to four times the volume of the shed blood or the shed blood plus 5 per cent glucose in water, in a volume equal to three times the blood removed. The efficacy of a balanced salt solution as treatment for experimental hemorrhagic shock was attributed to the replenishment of the functional sodium mass of the body and not to simply volume expansion. (Dillon, J., and others: *Treatment of Hemorrhagic Shock, Surg. Gynec. Obstet.* 122: 967 (May) 1966.)

SHOCK Heparinized dogs were made acutely hypotensive by either hemorrhage or histamine injections. During the first 20 to 30 minutes of hemorrhage when 30 to 40 per cent of the total blood volume had been lost, severe hypotension developed and definite physicochemical changes occurred in the blood. A marked increase occurred in screen filtration pressure without changes in blood viscosity. There was a decrease in the electrokinetic charge of the platelets and the red cells. Slight decreases occurred in the concentration of plasma protein with a greater percentage decrease occurring in the glycoproteins, hexosamine, and sialic acid. A continuous slight rise also occurred in the concentration of potassium ions and whole blood plasma and red cells. Plasma total lipids decreased and red cell lipids increased probably due to a shift of lipid in the plasma to the cells. In histamine hypotension, the increase in screen filtration pressure was less than during hemorrhage but it occurred immediately after the blood pressure fall. Platelet charge also fell immediately but there was no change in the charge on the red cells. There was a rapid development of hemoconcentration accompanied by an increase in the viscosity of whole blood and plasma. One hour later, hemodilution occurred with decreases in hematocrit and viscosity as well as the concentrations of plasma proteins. Of the protein components, only hexosamine decreased with the fall in blood pressure while the other components decreased later. (Hiscen, W., and others: *Physicochemical Changes in Circulating Canine Blood on Exsanguination or Administra-*