## KLOTZ: CLOSURE OF THE DUCTUS ARTERIOSUS

and found the most constant clinical symptoms to be (a) hypertrophy and dilatation of the right heart, and (b) a loud systolic murmur over the second left intercostal space. Hochhaus had a case which gave these signs and at autopsy the diagnosis of patent ductus arteriosus was verified, there being also a constriction of the aorta immediately above the ductus arteriosus.

To the many theories enunciated by other authors, Strassmann adds another. The relative pressures in the aorta and pulmonary artery become reversed immediately after the lungs are inflated. Then the blood-flow, instead of passing from the pulmonary artery to the aorta, attempts to pass in the reverse direction. However, as the relative pressure increases in the aorta, the upper and angular lip of the mouth of the ductus becomes pressed inward upon itself, and thus occludes the lumen. Strassmann claims to have demonstrated this valvular action of the aortic opening in the dead newborn child. He found that no fluid entered the ductus arteriosus when the injection was made into the aorta, and when the pressure was kept below 100 mm. of mercury.

Kiwisch gives a very comprehensive description of the circulatory changes occurring after birth. During the process of the expansion of the lungs, not only is the air but also the blood is made to enter this potential tissue. The supplying of the pulmonary radicles with larger quantities of blood necessarily utilizes some of the fluid formerly passing by way of the ductus arteriosus. Kiwisch believed that the nervous control played an important part in the active contraction of the ductus arteriosus, while a compensatory relaxation occurred in the vessels of the lungs, thus allowing freer access of blood into them. The final closure takes place, as Rokitansky also described it, by a proliferation of the tissues of the intima. without the intervention of a thrombus. Rokitansky also demonstrated that the occlusion of the ductus was not necessarily a simultaneous process throughout the vessel, but that different points of the vessel often became more contracted, and were earlier occluded than others. Such a condition in the vessel would give the appearance of aneurysm formation with thrombus production.

Langer was the first to note the microscopic appearance of the