

practically no pathological significance. Can we explain their appearance?

As to the first form—the basic systolic murmurs over the conus or pulmonary artery—there are various possibilities. As has been said, the structure of the pulmonary artery and orifice, as well as that of the aorta—a practically indistensible fibrous ring, with a highly distensible vessel beyond—is such that it is remarkable that systolic murmurs are not always present.

McCallum and I* have observed that in dogs it is extremely easy to produce a systolic murmur just beyond a pulmonic ring, following hæmorrhage. Here the excursions of the pulmonary artery were generally very large; in other words, the vessel was relaxed or the volume of blood thrown into the vessel with each systole was large. This was also true in cases where, after hæmorrhage, salt solution had been infused. Under these circumstances, also, the ventricular action appeared to be rather abrupt. Now, in anæmia, in general there is a rather low blood pressure. Furthermore, the changes in the blood itself might be expected to favor the appearance of murmurs (diminished specific gravity and viscosity). Especially important, however, the rate of blood flow per minute is greatly increased; more than this, the volume of blood thrown into the vessels with each ventricular contraction is larger than under normal circumstances. The conditions, then, which are present in anæmia—increased quantity of blood thrown with each systole through the aortic and pulmonary rings, which, as has been said, are more or less indistinguishable, the changes in the blood itself, and the relaxed condition of the vessels—are exactly those which one might postulate for the production of basic systolic murmurs.

The explanation, then, of systolic murmurs at aortic and pulmonic areas in anæmia is simple enough.

It is a question, however, whether any of these conditions play a part in the production of the basic murmurs so common in healthy young individuals. It is significant that these murmurs are heard on the left side of the sternum, and in the third space, rather below the pulmonary orifice. It is also remarkable that they are increased or induced by expiration, and diminished or obliterated by inspiration. These facts suggest another explanation.

Now McCallum and the writer observed that in dogs with

*Experimental studies on cardiac murmurs. *Am. J. M. Sc., Phila. & N. Y.*, 1917, cxxxi., 249.

†(Bestimmung des Herzschlag volumens. *Deutsche med. Wchenschr.*; 1909, xxxv., 239. Also Sauerstoffversorgung und Circulation in ihren kompensatorischen Wechselbeziehungen. *Verhaude. d. xxvi. Kong. f. inre. Med.*, Wiesb., 1909, 209.