Diseases of the Pericardium

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With 13 Figures

A. The Development of the Pericardial Cavity

When the human embryo is 1.5 mm. long the rudimentary heart may be seen as an aggregation of mesoblastic cells in the caudal portion of its upper pole. The paired pericardial cavities arise concurrently at the same site (Fig. 1). The development of the coelomic channels, first on a level with

![Diagram of pericardial cavity development](image)

Fig. 1. Schematic presentation of the formation of the nonpaired pericardial cavity (BROMAN)

the cardiac rudiment and later in the intestinal region, separates the heart and intestines from the lateral body walls. The coelomic cavity unites cranially with the paired pericardial spaces. Behind and in front the heart and intestines are attached to the body walls by structures called mesenteries. The ventral “mesocardium” soon disappears completely while part of the dorsal persists. Where the ventral mesocardium regresses the paired pericardial spaces coalesce to form a nonpaired cavity. By regression of the corresponding intestinal structures the initially separate body cavities unite into
a common chamber, the pericardiopleuropertoneal cavity, which now is paired only in certain sections above the stalk of the yolk sac and in the pelvic region. Of the ventral mesentery only a part persists and helps to form the definitive mediastinum.

The cardiac rudiment now resembles a vertical tube, the interior, thinner portion of which later becomes the endocardium. The outer, thicker portion develops into the myocardium and visceral pericardium. The caudal venous part lies embedded in a mesenchymal mass cranially in the still very wide umbilicus and is fixed to the lateral body walls by the primitive vascular sprigs. In the consequent dimensional decrease of the umbilicus and looping of the cardiac cylinder this mesenchymal mass develops into a frontally oblique partition, the septum transversum or primitive diaphragm (Fig. 2). The septum transversum is fused in its lower portion with the ventral body wall and laterally with the lateral walls. It terminates cranially in a free margin. The ventral surfaces are fused cranially with the dorsal mesocardium and the venous portion of the heart. The dorsal surface is attached by the ventral mesentery to the foregut. Two parts of the septum transversum can be distinguished, a larger, ventrocaudal part connecting with the liver and generally called the pericardioperitoneal septum and a smaller, dorsocranial part, the primitive pericardiopleural septum. The pericardial space is relatively large as early as the beginning of the second month of embryonic life. It lies ventral to the rudimentary pleural cavities which as yet are comparatively small. Cranial to both pleural spaces the dorsal wall of the pericardial chamber is formed by the dorsal body wall. The ventral mesentery, like the septum transversum, has a free upper margin above which the rudimentary pleural cavities communicate with the pericardial space and hence also with each other. This margin terminates roughly on a level with the septum transversum. The primitive vascular sprigs which run laterally into the venous portion of the heart form cranially arising, more and more protruding folds which fuse with each other and with the dorsal mesocardium. Together with the primitive pericardiopleural septum these structures form a coherent wall which communicates cranially with the dorsal body wall and in the second month of foetal life develops into the closed pericardial cavity.

B. The Function of the Pericardium

The pericardium is a completely closed sac of serous membrane surrounding the heart. Of its two layers the visceral is firmly attached to the heart. Between the layers is a narrow cavity which contains up to 20 cc of a clear fluid. The pericardium is constructed of stiff, poorly elasticized connective tissue lined with a layer of endothelial cells. These secrete the thin, clear fluid which prevents friction between the pericardial membranes. Because the collagenous fibres of the pericardial layers are wavy instead of straight, distention may take place in certain circumstances (Wallraf 1937). The outer surface of the pericardium is clothed with the pleural endothelium. These outer and inner layers of endothelial cells reduce friction to a minimum.

Whether or not the pericardium, in addition to its lubricating action, performs other functions under normal physiologic conditions is a question which has long been explored in animal experiments. In 1898 Barnard expressed the opinion that the pericardium limits dilatation of the heart, thus reducing the strain on the cardiac musculature during diastole, particularly in the right ventricle. Passive dilatation was likewise considered to be limited by the pericardium. In support of his statements Barnard presented the following findings.