Relationship between Clinical Features and Histopathologic Findings in Patients with Pulmonary Vein Stenosis

Mykychak Y¹, Kozhokar D¹, Yusifli I.¹, Yachnik O¹, Zakharova V², Yemets I.¹

¹Ukrainian Children’s Cardiac Center, Kyiv, Ukraine
²National M. M. Amosov Institute of Cardiovascular Surgery of the National Academy of Medical Sciences of Ukraine, Kyiv, Ukraine

Abstract. Pulmonary vein stenosis (PVS) is a rare but serious condition characterized by obstruction of extrapulmonary segments of pulmonary veins which leads to progressive pulmonary hypertension.

Objective. In this study we aimed to determine relationship between clinical features and histopathologic findings in patients with PVS.

Material and methods. We retrospectively reviewed 34 consecutive patients who underwent PV stenosis repair. Surgical wedge biopsy specimens were collected intraoperatively in 11 patients and reviewed using light microscopy.

Results. Affected pulmonary veins in patients with primary PVS were characterized by diffuse stenosis extending into the lung parenchyma. In post-surgical group stenosis was found in a limited segment of pulmonary vein at its ostium. Microscopically, abnormal intimal proliferation was identified in both patient groups. Scaring was predominant finding in patients with post-surgical PVS.

Conclusion. In patients with PVS, pathophysiological mechanism influences the severity and extent of clinical manifestations. A comprehensive understanding of this mechanism may improve results of the treatment.

Keywords: pulmonary vein stenosis, pulmonary hypertension, total anomalous pulmonary venous connection, intimal proliferation.
stenotic pulmonary veins (Fig. 1) in both groups of patients. Meanwhile, in specimens obtained from post-surgical patients, scaring was predominant finding. Typical fibromyxoid intimal thickening was absent in only one specimen obtained from post-surgical patient. Heavily collagenized scarring at the site of direct veno-atrial anastomosis (Fig. 2) caused luminal obstruction in this case. This patient subsequently underwent a series of repeated balloon angioplasties described previously [12].

Discussion. We studied and compared clinical features and histopathologic findings in patients with PVS. We found that patients with primary PVS are characterized by diffuse stenosis of pulmonary veins extending to the vessels of intraparenchymal segment, while in post-surgical group stenosis was mostly limited to an ostial segment of pulmonary vein. Microscopical examination revealed that specimens obtained from the patients from both primary and post-surgical PVS group had fibromyxoid intimal thickening, typical for this lesion, although in post-surgical PVS scaring was predominant finding. Thus, we identified correlation between clinical manifestation and histological findings in patients with PVS.

Surgical repair or transcatheter intervention is the main current therapeutic strategy, with results being, however, quite disappointing. The novel treatment should be targeted at pathophysiological mechanism. Ongoing medical treatment research is aimed at different pathogenetic mechanisms of PVS [9]. Callahan et al. [10], Kato H et al. [11] have shown that activation of tyrosine kinase and angiotensin II pathways leads to PVS. Currently, there are 3 registered clinical trials related to PVS treatment. In two trials tyrosine-kinase pathway was targeted using known chemotherapeutic agents. The third trial studies losartan as an agent to reduce neointimal formation by blocking TGF-B and angiotensin II mediated endothelial to mesenchymal transition.

In our study we have identified typical histological findings characteristic for each of PVS subtypes. They reflect pathogenetic mechanism and influence further outcomes such as mortality and recurrence rates. Fibrointimal proliferation is the main cause of disease progression and recurrence of PVS.

Conclusion. Certain pathophysiological mechanisms have been shown to influence the severity of clinical manifestation in different types of PVS. A comprehensive understanding of these mechanisms may improve results of the treatment.

References