Images in vascular medicine

Morphologic and functional assessment of extensive pulmonary arteriovenous malformations using MRI

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Panel A

Panel B

A 17-year-old woman had suffered from dyspnoea and cyanosis since childhood. Physical examination revealed central and peripheral cyanosis. Auscultation of the heart and lungs was unremarkable. Arterial blood gas analysis demonstrated an oxygenation saturation of 83%. This did not improve during inhalation of oxygen. Echocardiography showed good left ventricular function; the ventricles and atria were not enlarged. Intracardiac shunts, patent ductus arteriosus and valve disease were excluded.

Intravenous administration of D-galactose-microbubbles caused an enhancement of the left atrium and ventricle, consistent with an intracardiac or extracardiac shunt. A chest radiograph showed diffuse opacities in the periphery of the right lung (Panel A, arrows). Owing to the differential diagnosis of abnormal pulmonary vasculature, the patient was referred for cardiovascular MRI.

Panel C

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Using contrast-enhanced MR angiography we found multiple arteriovenous malformations mainly in the upper and middle lobe of the right lung (Panel B, arrows; PA = pulmonary artery, PV = pulmonary vein). These were not configured in a typical way as nodular structures with feeding (Panel C, dotted arrow) and draining vessels (Panel C, curved arrow), but showed a reticular pattern.

Velocity-encoded MRI-based flow measurement excluded a left-to-right shunt comparing flow volumes of the main pulmonary arteries and ascending aorta.

In order to quantify the intrapulmonary shunt volume we performed further flow measurements in the segmental pulmonary veins draining the three main malformations. Over 30% of the pulmonary blood flow shunted through the arteriovenous malformations, explaining decreased blood oxygen saturation, the dyspnoea and the abnormal findings of contrast-enhanced echocardiography.

In our report, we present the potential of MRI to detect even very rare malformations of the pulmonary vasculature and to allow for functional assessment of haemodynamic parameters.

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