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Cardiac Magnetic Resonance Imaging (CMRI)

Announcer:

Welcome to CME on ReachMD. This episode is part of our MinuteCME curriculum and is titled "Cardiac Magnetic Resonance Imaging (CMRI)".

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Dr. Preston:

Cardiac MRI as a tool for diagnosis in pulmonary hypertension. So, cardiac and lung perfusion MRIs. MRI can provide anatomical and functional assessment of both pulmonary circulation and the heart, with a major advantage of not using ionized radiation. Diagnostic for congenital abnormalities has a strong potential. With video techniques, it gives robust qualitative and quantitative assessment of the right ventricle, but also of all the other chambers. And it can measure the stroke volume, not only of the left but also of the right ventricle, and flow, cardiac index. The curvature of the left ventricular septal wall is a classic sign to depict elevated RV systolic pressures. Now on the other hand, the phase-contrast MRI can also quantify blood flow and peak velocity, not only in the main pulmonary artery, but also in all of the vessels within the chest. So, it can give a better estimation of the regional areas where the flow decreases significantly. The sequences assess differential blood flow to the right and the left lung and seem to reflect PAP pressure measurements obtained by invasive right heart catheterization. Now cardiac MRI, although it gives beautiful pictures and also functional aspects of the heart, both right and the left, it's not as of today the main diagnostic tool to confirm pulmonary arterial hypertension. The right heart catheterization is still the diagnostic tool.

So, is there a role for cardiac MRI in pulmonary hypertension? Well, the pros are it's noninvasive. It aids in the diagnosis and prognosis of pulmonary hypertension patients. It gives you a very accurate function of the RV. And it can pick up potential congenital abnormalities that again, as we were talking a little earlier, can be diagnosed in the adulthood. Now the cons are, they're difficult for patients who are receiving pump therapy for PH, for example. They're difficult for patients who are claustrophobic. And it's not only a five-minute test. For cardiac MRI, patients can stay in the tunnel for quite a long time, and it can be unnerving. Magnetic resonance angiograms and perfusion images. So, let's talk about these modalities. In IPAH, you can find with these techniques vessel tortuosity and patchy perfusion. Now, this is different from pulmonary hypertension, from chronic lung disease such as COPD, where you have typical vessels splaying seen in patients with COPD or emphysema, and areas of associated reduced perfusion in the upper zones where most of the time emphysema is more severe or only there. Now in contrast, in CTEPH, you can see vessel stenoses and occlusions, and the associated segmental perfusion defects are distal to those stenoses. So, the pictures that the MR angiograms and perfusion images give you can give you a clue of the type of pulmonary hypertension, whether it's idiopathic or group one, or group three, or group four.

So, MRI investigation of suspected pulmonary hypertension. What can we learn? We can see the size of the blood vessels of the pulmonary arteries, and in the left panel this is an MR in a normal patient, and then on the right patient with severe PH. And you can notice that the blood flow from the pulmonary trunk into the pulmonary arteries in PH patient is delayed and it's abnormal because it doesn't have a laminar flow. It's turbulent and that can suggest the presence of pulmonary hypertension.

So, there are other certain cardiac MRI features that can not only help diagnose or estimate pulmonary hypertension, the presence of

pulmonary hypertension, but also can predict the outcomes. The cardiac MRI can give you right ventricular ejection fraction. And RVEF has been shown to be a good prognostic parameter in patients with PAH. And if you look at this study that the graph highlights, the results from the RV ejection fraction is associated with survival in patients who are medically treated for PAH. So if they're medically treated but the RVF is low, there's still high mortality. And this study showed that it was this mortality association was present regardless of whether the pulmonary vascular resistance was high or low. So, RVF obtained by cardiac MRI has a very good prognostic qualities.

Announcer:

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