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ReachMD
www.reachmd.com
info@reachmd.com
(866) 423-7849

Areas: A Look at the Importance of Physical Measurements of the Right Heart

Announcer:
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Dr. Krasuski:
Hello, I'm Dr. Richard Krasuski from Duke University. Today we're going to take A Look at the Importance of Physical Measurements of the Right Heart, specifically focusing on areas.

The right heart is a very complicated and difficult-to-measure structure. It sits very close to the chest wall, it's very difficult to get in one view. And so ideally, you want to view it from many different angles, because that gives you the most comprehensive assessment of size, shape, function, and potentially hemodynamics. First of all, there's the parasternal view. Often, we look in the parasternal short axis, which gives us a nice view of the right ventricular outflow tract. We look in the apical view, which allows us to look at the right ventricle and the right atrium very nicely. And then the subcostal view, where we can look for right ventricular wall thickness, and also the dimension of the inferior vena cava and its collapsibility.

Now, the measurements used for quantification of right heart have been defined by the ASE guidelines back in 2010. Typically, the one that's most utilized is the RV dimension at the base level, knowing that that's greater than 42. Oftentimes, we'll use this as a ratio between the RV and the LV. For right atrial dimensions, we're typically looking at the right atrial area, which is greater than 18 centimeters squared in patients with pulmonary hypertension. And finally, the right ventricular wall thickness, which is again assessed in the subcostal view. And ideally, we're looking for thickness greater than 5 millimeters, which indicates that there's right ventricular hypertrophy, which is consistent with right ventricular pressure overload.

Now first, assessing the fractional area change of the right ventricle, we want to ideally view this in the apical four-chamber view. We're going to look at both diastole and systole, and look at the change. The calculation is typically done by looking at the right ventricular end-diastolic area, subtracting the right ventricular end-systolic area, and then dividing that by the right ventricular end-diastolic area. So in this example shown, you can see 35.4 was the end-diastolic area, or subtracting 18.3, which is the end-systolic area and dividing it by 35.4, and we get 48%. So this is a patient who, in fact, has normal-looking fractional area change, and not pulmonary hypertension, where you'd typically expect somebody to have a fractional area change less than 35%.

Now fractional area change in general is going to be proportionately less than the ejection fraction of the right ventricle. And you can see some of these numbers that have been worked through in the past with about a fractional area 50% being equal to an ejection fraction of about 66%.

Now additionally, we can look at the right atrial area, and you can see the tracing, you can make a round to look at the right atrial area. And ideally, a patient with pulmonary hypertension is going to have an enlarged right atrial area, typically greater than 18 centimeters squared. In this case, it's considerably greater than that.

Finally, we look at that subcostal view. And again, we're going to look specifically at the right ventricle here. And we're going to look at

the wall thickness of that free wall of the right ventricle. Typically, will not use the interventricular septum because it's often difficult to distinguish which part of that septum belongs to the RV, and which part of that septum belongs to the LV. So in this case, what we've done is we're looking at the right ventricular free wall, we go into a zoomed image, which you can see in Panel B. And then we typically use M-mode. M-mode is really the most accurate way to get a measurement, although it can also be done 2-dimensionally with that standard image. And then you measure it by M-mode, and you measure it in diastole. And again, a thickness greater than 5 millimeters indicates the right ventricle is hypertrophied and may suggest right ventricular pressure overload as long as there's absence of other pathologies. In particular, looking at right ventricular outflow obstruction, things like pulmonary stenosis branch, pulmonary stenosis, this all needs to be ruled out when you're trying to diagnose pulmonary hypertension.

So in summary, today, we've talked about making measurements of the right heart. And remember, we're looking at the right ventricle, we're looking at the right atrium, and then we're also looking at the pulmonary arteries as well. And so these are the measurements that are essential when we're trying to diagnose pulmonary hypertension.

I thank you for joining me today and for your attention.

Announcer:
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