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### What's the Issue With Getting Hemodynamic Pressure Estimates Using Echo? – Part 2

#### Announcer:

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#### Dr. Sadek:

Hi, this is Ahmed Sadek, Assistant Professor of Medicine at Temple within the Pulmonary Hypertension Group. And so, we'll continue our discussion here of some of the issues with relying on the hemodynamic pressure estimates by echo, particularly with a focus on people that truly have PAH.

And so in this case, we have a 32-year-old female with a history of exertional syncope, leg swelling. She has a TR Vmax, you see on the left, of 270 centimeters per second, which equates to a grading of 29. And this falls below the threshold of concern for pulmonary hypertension, which we usually consider at 280 centimeters per second. But there are clear other signs of structural signs of pulmonary hypertension seen in this patient. In the middle image, you see severe interventricular septal flattening. On the right-sided image, you see severe RV enlargement, there's dysfunction, RV to left ventricular ratio is greater than 1.5, and you see right atrial enlargement. And so not surprisingly, her right heart cath data showed a right atrial pressure of 6, wedge pressure of 8, and her PVR came out to 8.66 Wood units.

And so, this is just to emphasize that in those patients, you really should be looking not only at the RVSP or PASP estimate, but keep an eye out for other signs of PAH signs. And even in the absence of a velocity of greater than 2.8, you should still be suspicious if you see these other structural signs.

This study kind of comments on the accuracy of the PASP or RVSP estimate in general. This was a 65-patient prospective study and it looked at patients who had received a right heart cath within an hour of an echocardiogram. And they compared the right heart cath numbers versus the echo-derived PASP. And you can see that the patients were derived into tertiles of severity with severe, moderate, and mild as labeled below. And you can see here that in almost a third of the patients, the echo estimate was discrepant by more than one category. And you can see in that first example, on the top, you can see that the first patient was categorized as mild pulmonary hypertension by the Doppler. But by right heart cath was categorized as severe. Eighteen percent of these were an underestimation by Doppler, which in my view is the more dangerous of the two as opposed to overestimation. And in 20 of 29 patients, the echo estimated the right atrial pressure at over 15 when in fact the right heart cath right atrial pressure was less than 10. And this was the cause of at least 50% of the PASP overestimations.

And then, kind of one final point looking at RVSP estimation is regarding risk. And so I have two examples here. And the question is which of these two patients is at higher risk from a pulmonary hypertension standpoint? You have patient 1, who has an RVSP on the left estimated at 74. And you see that middle image there, you have normal RV size and function, and a normal TAPSE of 2.4 centimeters. And you see the patient presented as an office visit, has a BNP of 25, functional class II symptoms, a 6-minute walk test a 502. And these are the right heart cath results on the left. Notably, the right atrial pressure is 5 with a wedge of 11, cardiac index of 3.19, and the PVR was 6.36 Wood units.

And then you have a patient 2. And you see on that image, the RVSP was estimated as slightly less at 60. But on the echo, you can see severe RV enlargement all the way on the right, as well as right atrial enlargement, and the TAPSE is reduced at 1.4. This patient was actually admitted to the CCU with heart failure, acute renal failure, had functional class III symptoms, a BNP of 454. And you can see the right heart cath results here, remarkable for a PVR of 10.7 Wood units and cardiac index of 1.77.

And so the patient that's higher risk is actually patient 2. Despite having a slightly lower RVSP estimate and even a slightly lower PSP by right heart cath, there are clear high-risk features that are present in this patient that were not present in the patient 1, and those include the elevated BNP, functional class III symptoms, and the low cardiac index of 1.77. And so the point that I'm trying to make here is that these hemodynamic pressure estimates do not adequately risk stratify patients when viewed in isolation.

And this study further illustrates this. This was a study of 146 patients comparing various echocardiographic parameters and how they compare with the patient's risk status. As you can see, many of the right function - the right heart functional parameters by echo, including fractional area change and TAPSE, correlate significantly with risk. But in particular, the PASP does not. And there is really no significant difference here between the PASP based on the risk status of the patients.

That's it for this episode. Thank you guys very much for your time.

**Announcer:**

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