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What's the Issue With Getting Hemodynamic Pressure Estimates Using Echo? – Part 1

Announcer:
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Dr. Sadek:
My name is Ahmed Sadek. I'm one of the Assistant Professors of Medicine at Temple within the pulmonary hypertension group. And in this episode, we'll be talking about some of the issues with relying on hemodynamic pressure estimates, with echocardiogram, specifically with a focus on conditions which limit the applicability of the RVSP estimate.

And so, just as a reminder, the TR jet gives us only an estimate of the PA systolic pressure. And it relies on the fact that, in most cases, the RV systolic pressure is equal to the PA systolic pressure. And so it's estimated using the simplified Bernoulli equation where we take the velocity of the TR jet V-squared times 4 plus the right atrial pressure. And that gives us the RVSP estimate.

And in these cases, the quality of the TR jet really matters. Here, you see some examples. On the left most you have a very nice and dense TR jet, and you can very clearly see the peak, and you can very clearly see where the peak velocity is. Whereas in the rightmost case, there is a very poor-quality TR jet, you cannot see clearly where the peak is. And so any attempt at estimating the RVSP here would be a bit of a guess.

And this is a good example of this. So this was a 38-year-old female, who was 20 weeks gestation, referred for evaluation of pulmonary hypertension. And you can take a look, this is the TR jet that was used to estimate the pulmonary artery systolic pressure. It's not dense at all, it's a pretty poor-quality jet. And there was an attempt here to place the cursor at the peak, but you really can't very well see the peak here. And so the RVSP was estimated as 44 in this case. But if you look at the actual ehco, the RV structure looks normal, there's normal RV size and function, and really no other indication of pulmonary hypertension. So it really is unlikely that this patient truly has pulmonary hypertension.

This case illustrates another limitation of our RVSP estimation. And this is an 83-year-old female. She has a past medical history of Sjogren's, atrial fibrillation, and she's presenting with heart failure. And if you notice in these views, in this RV inflow view, you see a tricuspid valve that's not really collecting 02:34 well. You see severe tricuspid regurgitation, and biatrial enlargement with the right atrium bigger than the left and significant right ventricular dilation.

And so in severe tricuspid regurgitation, the flow is laminar. And so what ends up happening is that the right atrium essentially becomes ventricularized. And you really - you lose the gradient between the right atrium and the RV. And that results in us not being able to use the simplified Bernoulli equation to estimate PASP. And so that TR jet estimate really does not hold in this case.

And so it can be challenging to differentiate primary TR process from a PAH-associated process, especially when there's significant RV dilation based on echo. But clues that point to PAH are looking for other structural signs, such as systolic interventricular septal flattening, acceleration time of the RVOT, pulse wave Doppler, as well as our RVOT pulse wave Doppler notching.

So one final case for this section to illustrate another limitation of this RVSP estimate. Here you have a 61-year-old male with a history of

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complex congenital heart disease, most importantly, including the RVOT reconstruction with pulmonary valve replacement. So on the left here, you see the estimated RVSP based on the TR velocity of 310. And adding the right atrial pressure, this was estimated at 53. And on the right image, you know, one thing to note is you do see that there is actually a gradient across the pulmonic valve with a peak gradient of 32, which equates to mild to moderate pulmonic valve stenosis.

So in the case of pulmonic valve stenosis, that assumption that the RV systolic pressure and PA systolic pressure is equal does not hold. And so if you want to calculate a PASP in this case, you have to take into regard this gradient, and subtract the RV systolic pressure, or subtract the pulmonary valve gradient from the RV systolic pressure. And that's 53 minus 32. And that leaves a true PASP estimate of 21.

And that's it for this current episode. Thank you guys for your time. We'll see you on the next episode.

Announcer:
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