LETTERS TO THE EDITOR

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Assessment of severity of pulmonary regurgitation

We read with interest the recommendations concerning assessment of PR by Lancelotti *et al.*[1] on behalf of the European Association of Echocardiography (EAE). Until now, recommendations for assessment of severity of PR have been scarce and the EAE must be commended for this initiative.

We would like to add some information available in the literature to reinforce and further refine the proposed methods of assessment of PR severity.

Concerning the definition of severe PR, we would like to underline that in patients with normal pulmonary artery pressures, PR fraction is limited by fast equilibration of pulmonary artery and diastolic right ventricular pressures. Therefore, regurgitation fractions above 40% are relatively rare, even with free regurgitation without any valvular function.[2] Cardiac magnetic resonance imaging (CMR) is nowadays the gold standard to measure regurgitation fraction of the pulmonary valve. A regurgitation fraction of >20% assessed with CMR is associated with the same magnitude of right ventricular enlargement as a regurgitation fraction of >40%. Therefore, a regurgitation fraction of >20% can be regarded as severe regurgitation.[2]

The authors state that rapid deceleration rate of the continuous wave (CW) Doppler signal with termination of flow in mid- to late diastole is not specific but compatible with severe regurgitation. Two studies investigated the PHT of the CW Doppler signal and identified a PHT <100 ms to be highly sensitive and specific to identify severe PR as diagnosed by angiography or magnetic resonance imaging (sensitivity of 76 and 93% and specificity of 94 and 93%).[2,3] These studies were performed in patients with congenital heart disease, mainly patients after repair of tetralogy of Fallot or after pulmonary valvulotomy. PHT is dependant not only on PR severity but also on diastolic intrapulmonary pressures and on diastolic properties of the right ventricle, with shorter PHT when right ventricular physiology is restrictive. Despite these limitations, PHT <100 ms proved to be useful to identify severe PR.

The vena contracta is difficult to define in many patients with PR, especially when free PR exists. In patients with tetralogy of Fallot, for example, severe PR often orginates in the distal pulmonary arteries. In these patients, the PISA method is also not applicable, as jet acceleration is not present. PR jet width is wider applicable. A jet/annulus width of >50% identified patients with a regurgitation fraction >20% with sensitivity of 92% and specificity of 100%; while a regurgitation fraction of >40% was less accurately identified by jet/annular width of >70%;[4] however, proposed criteria differ between several studies.

In our experience, further refinement of the proposed criteria to grade PR severity (i.e. specify 'steep deceleration' as PHT <100 ms; and 'wide origin of colour flow jet' as jet width >50% of annular width) is helpful in clinical practice for the grading of PR. However, further validation is necessary especially in patients with elevated intrapulmonary pressures.

We agree with the authors that always different criteria should be used to corroborate each other.

References

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Assessment of severity of pulmonary regurgitation: reply

I personally thank Petronella Pieper and Candice Silversides for their interesting comments. In our 'imaging world', Doppler echocardiography remains the most reliable non-invasive imaging modality for the diagnosis and evaluation of pulmonary regurgitation (PR). As for each valve, the echo examination starts with a two-dimensional echocardiographic assessment of pulmonary valve morphology to identify significant valvular defect in favour of severe PR. Then, a careful assessment of the regurgitant jet by colour Doppler, using multiple views, can rapidly diagnose minimal PR, which is the case in the majority of patients. In this situation, no further quantification is required. In the other situations, the use of a more quantitative method is advised. However, in the setting of PR, there are very few validated studies regarding its evaluation. Furthermore, in the absence of extensive data on quantification of PR, the experts recommend to assess the PR severity by using the different approaches available and to corroborate each other. The recent recommendations concerning the assessment of aortic and PR published by Lancellotti *et al.*[1] on behalf of the European Association of Echocardiography (EAE) are based upon a consensus of experts according to the available relevant literature on the subject. Among the existing approaches, continuous-wave Doppler is frequently used to evaluate PR. In mild regurgitation, there is a slow deceleration of the jet velocity, whereas in severe regurgitation, a rapid deceleration rate with termination of flow in mid- to late diastole can occur. A pressure halftime of the continuous-wave Doppler signal of <100 ms has been proposed to identify severe PR.[2] Although this cut-off value might be used to orientate towards a severe regurgitation, its clinical value remains

unfortunately limited by the lack of large studies validating it. Moreover, it is affected by several other factors than the severity of PR as the diastolic properties of the right ventricle (RV). Another interesting parameter is the ratio of maximum colour jet diameter (width) to the RV outflow tract width. In the current recommendations, the expert reported that a jet width that occupies >65% of the RV outflow tract width measured in the same frame is in favour of severe regurgitation. However, this measurement should be regarded with caution as it suffers from a high inter-observer variability and proposed cut-offs of severities differ between studies. In conclusion, more suited parameters are required to refine the evaluation of PR. Those proposed in the current recommendations are not perfect but reflect the paucity of robust validated parameters.

References

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