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Editorial

All for one, but not one for all <Guideline needed; which and when should we use>

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Guideline

Using ultrasound, magnetic resonance imaging, or radiation (i.e. ventriculogram or computed tomography) with acceleration of CPU or GPU speed development, the cardiovascular anatomical and functional imaging modalities have matured and been clinically available in advanced countries in this century. The apparent images or movies by the "New world" techniques can visualize as if we are seeing the heart or valve directly like a 'fantastic voyage', and estimated data (valvular area, etc.) from them are now absolutely necessary for our clinical decisions.

In the current Case Report [1] of the *Journal*, the authors have reported the case of a 16-year-old who suffered rheumatic heart disease ("an old world disease"), which was successfully diagnosed with 2D transthoracic echocardiography (2D-TTE), 2D and 3D transesophageal echocardiography (2D-, 3D-TEE), and cardiac magnetic resonance imaging (CMR). The authors have reported the usefulness of such a multimodality strategy in the clinical arena.

The 2D-TTE image quality obtained from the apical and parasternal window was reasonable, and the transmitral Doppler signal was adequately clear, so that it seemed sufficient to reach a final conclusion for the pathological condition and severity of the mitral stenosis of the patient. The recently well-matured method of 3D-TTE was not used regrettably. The 2D-TEE had essentially the same information as the 2D-TTE, but the 3D-TTE image was beautiful. The authors thoroughly performed CMR to know the etiology of the left ventricular dysfunction and confirm the "anatomical structure" of the mitral valve (just mentioned as commissural fusion in the text) for the "additional information" to their surgeon for mitral valve replacement (not repair). Because the surgical finding or surgeons' comments were not included in the report, the "additional information" (which would be critically important) was unfortunately unclear after the successful procedure.

In the "New world", we may have the luxury of choice for medical imaging studies. This means that we have to think what is enough. We, the clinicians have to understand the features of each modality well. These features include accuracy, reliability, availability, particular ability (merit/demerit, advantage/disadvantage, or strength/weakness of each one), approximate time required, invasiveness, versatility, and cost.

Versatility sounds respectable; 'one-size fits all' is very convenient and might be ideal. CMR might provide all information we and the patients need, it is based on less time-resolution, and high cost [2]. In reality, such versatility may not matter, because we can smartly apply a couple of modalities in a mutually complementary manner. There is no point in striving for mastery (e.g. MRI is superior to echocardiography). We have to maximize accuracy, and reliability; and have to minimize time required, invasiveness, and cost. One modality avoids the need for all purpose. Besides no one can perform CMR and computed tomography frequently or serially.

2D-TTE is always the first-line examination that we perform daily. The "old world" modality actually works well mostly. The problem is when the first one does not work and we could not reach enough conclusions (could not make clinical decision), and then what imaging modality we should use next. This is a common occurrence in Asian populations due to the narrower intercostal space than western ones. However, performing all modalities is apparently too much for patient management.

Atrial fibrillation remains an inherent problem and should overcome all 3D imaging modalities to make images align completely. Relatively higher simple 2D-TTE may provide useful and important information in this situation.

The ability to detect mural thrombi in the left atria, appendage, and ventricle with TEE is certainly superior to the transthoracic approach. Information about the existence of intracardiac thrombus is also important when surgery is planned. What about when TEE or CMR indicate no thrombi in the heart? An experienced surgeon would view this with caution. They operate the procedures with much caution in case thrombi may be there. So we are never able to say that there is not a thrombus; we can only say there is or it could not be observed at the time of the study.

For several cardiovascular diseases, in guidelines initiated by American academic societies, a consensus of experts has suggested adequate use of multimodalities [3,4]. Regarding valvular heart disease, it seems that many investigators contributed to valuable articles for establishing this [5–11], which would lead us to the most affordable strategy in each clinical scenario. Discordance in estimated valvular area (irrespective of valvular stenosis or incompetence) would be expected; the estimated value

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with the transvalvular velocity-approach and direct measurement (planimetry) should be different. As we know, aortic and mitral valves behave quite dynamically [12], to image those adequate time-resolution is necessary. A major weakness of the echocardiographic approach may be imaging of the tricuspid valve and right atria and ventricle. That may be game time of CMR or computed tomography. We have to know the habits of each modality although, it seems that the most imperative issue is providing benefit to the patients rather than desiring ultimate accurate measurement of the valvular area. Overestimation of stenosis should be avoided, and of regurgitant area may be accepted, because as a gate-keeper it should raise an alarm rather than missing it.

The "additive information" for the surgeons' making preoperative tactics is also of great interest. Their thoughts (what the surgeons would like to know before the cardiac surgery) should be sufficiently reflected in the guidelines.

There is only one mission for all cardiac modalities; which is to provide benefits for patient's symptoms and survival. If patients could have the full benefit, that is enough. For the patients' benefits, we working in the "New world" would perform them necessarily and sufficiently, not using all of those that we have.

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