LETTER TO THE EDITOR

The PISA method simplified

We have read with interest the study by Messika-Zeitoun et al. showing that using a fixed angle value of 100° provides an accurate estimation of the mitral valve area (MVA) by the proximal isovelocity surface area (PISA) method in patients with mitral stenosis (MS). We appreciate the study as a means to make PISA method more popular in assessing the MVA. Although not cited in the article, we also had had some efforts to simplify the PISA methods. In one study, we used the spheric cap model. In this model, there is no need to measure the angle because the area of the spheric cap is dependent on the height and width of the cap. These parameters are measured directly from the view, alleviating the need for using protractor. The model was valid in patients with and without aortic regurgitation. Another advantage of the method was that there was also no need to measure radius. However, this method has not been enough to make the PISA method more popular among echocardiographers. We think the reason is that the height of the cap is so small that minor errors in the measurement resulted in major deviations in the calculated MVA. Although the minor errors are minimal during a study environment, they may be more prominent in routine use. Afterwards, we proposed another simplified method, which again alleviates the need for angle correction. In this method, we assumed that there is a triangle, of which one corner is located on the orifice and the borders are formed by the valves. We also assumed that the adjacent borders are 1 cm in length. The length of the border which is opposite to the PISA angle (α) is a function of the α. This function can be expressed as follows: \( \alpha = \arccos \left( \frac{2 - a^2}{2} \right) \). The linear regression analysis has revealed that this relation is almost linear in the range of \( \alpha = 60° - 155° \) \( (r = 0.99) \). This relationship provided the use of PISA method without measuring PISA angle. Over and above, the angle correction was not neglected in this method.

In our opinion, the method proposed by Messika-Zeitoun et al. is subject to some errors. In their study, the angle range was 90°–115°. This means that there is 11% overestimation and 11.5% underestimation at most with the use of 100° as the fixed angle. If they had used our second method, the deviations would have been about 3%. In addition, the authors are lucky because the angle range is quite narrow. In a previous study by Messika-Zeitoun et al., the angle range was also defined as 127° ± 27°. In our study, this range was 76°–144°. If we had had used the method of Messika-Zeitoun et al., the deviation would have been about 30%, which is very important in most cases.

However, we think this method is still valuable because: (1) It is really simple so that it may increase the popularity of the method; (2) The visual assessment of the angle by the experienced echocardiographers is often possible in many patients. If the echocardiographer thinks that the angle is about 100°, why not to use the method?

References


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