Right ventricular volume determination: not a matter for echocardiography

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TO THE EDITOR: Potkin and coworkers (3) recently reported in the Journal of Applied Physiology on an original investigation concerning the cardiovascular changes induced by glossopharyngeal insufflation in breath-hold divers. Authors obtained echocardiographic data suggesting an acute right ventricular pressure overload and a parallel left ventricular dysfunction, interpreted as a consequence of ventricular interdependence.

The echocardiographic methods used in the paper deserve, in our opinion, a few comments. As known, right ventricular anatomy is far more complex than left ventricular anatomy. While left ventricular volumes may be easily and accurately estimated by a number of mathematical formulas (ranging from the m-Mode-derived Teichholz’s to the two-dimensional area-length and Simpson’s methods; Refs. 1, 4, 5), right ventricle has a complex three-dimensional shape that substantially prevents a feasible echocardiographic way to derive its volume. Even if some ultrasonographic three-dimensional methods seem to be promising (2), first-pass radionuclide angiography still represents the gold standard for a quantitative approach to right ventricular anatomy, and a simply qualitative (or at most semiquantitative) approach seems to be advisable for echocardiography (6).

In their paper, despite windowing limitation imposed by high lung volumes (only subcostal view was accessible), Potkin and coworkers calculated the volumes of both ventricles by Simpson’s rule, obtaining quite puzzling results. In fact, simply considering the evaluation at rest, mean values of diastolic and systolic right ventricular volumes are surprisingly low (20 and 5.2 cm³, respectively). Moreover, the estimate of stroke volumes and cardiac output of both ventricles (obtained by mean values of heart rate and ventricular volumes reported in Table 3) shows a huge imbalance between the ventricles, with right ventricular stroke volume and cardiac output less than a quarter of the left ventricular ones.

Even if the aforementioned methodological limitations greatly reduce the strength of results, the paper presents, in our opinion, the interesting hypothesis that lung packing may induce a biventricular systolic dysfunction mediated by an acute right ventricular pressure overload. This hypothesis should be confirmed, by means of more reliable techniques, for a better understanding of hemodynamic consequences of glossopharyngeal insufflation, a widely diffused breathing technique among elite breath-hold divers the health risks of which are not yet clearly defined.

REFERENCES


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