Paradoxical McConnell’s Sign: A Case Report on Right Ventricular Wall Abnormalities in Acute Pulmonary Embolism

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INTRODUCTION

Diagnosing a massive pulmonary embolism (PE) is not always straightforward. Multiple risk stratification tools and imaging studies are now available to help aid in making the diagnosis. In unstable patients, however, the diagnosis is often difficult to make. McConnell et al. first characterized a distinctive pattern of right ventricular (RV) heart strain seen on transthoracic echocardiography (TTE) that has been used to help aid in making the diagnosis of PE for more than 20 years. They described a pattern in which the motion of the apex of the RV free wall was preserved, with hypokinesis of the corresponding midregion of the free wall of the right ventricle. Even though this sign is fairly specific for a massive PE, studies have shown that McConnell’s sign is not very sensitive for making this diagnosis (about 56%–70%). This case report highlights a specific pattern of RV heart strain seen during an acute PE that is contrary to McConnell’s sign, which can also be used to quickly diagnose a massive PE.

CASE PRESENTATION

A 76-year-old woman originally presented to the emergency department after a rapid response was called for lethargy and altered mental status during routine dual-energy x-ray absorptiometry. Upon arrival to the emergency department, she subsequently went into cardiac arrest due to pulseless electrical activity and was revived after two rounds of cardiopulmonary resuscitation and one round of epinephrine. Her rhythm on electrocardiography at the time showed sinus tachycardia, with no evidence of ischemia. She was hypotensive and unresponsive and was subsequently intubated for airway protection. The patient was also given a pressor to maintain adequate blood pressure. Limited bedside TTE done in the emergency department was conducted within 10 min of her revival. It showed a dilated right ventricle in addition to an unusual RV free wall abnormality (Videos 1A, 1B, and 1C). The apex and distal regions of the RV free wall were akinetic, and the basal to middle portion was hyperkinetic. Tricuspid annular plane systolic excursion and tissue Doppler (S’) taken in M mode during the original presentation were borderline normal (Figure 2), despite the very clear RV systolic dysfunction. It is clear in this case that these values are not always indicative of assessing the overall systolic function of the right ventricle.

DISCUSSION

Although the characteristic pattern of McConnell’s sign is often useful to help diagnose a massive PE, the present case report demonstrates that other patterns on TTE may also be indicative of this disease process. The patient initially presented with a pattern of right heart strain that manifested as a paradoxical pattern as to the classic McConnell’s sign, with an akinetic RV free wall in the apical and distal regions along with a hyperkinetic basal to middle portion of the RV free wall. Tricuspid annular plane systolic excursion and tissue Doppler (S’) in the hospital on a therapeutic warfarin dose.

This particular pattern of findings on echocardiography appears to be quite rare and has been previously reported in the literature only twice, as case reports. Like that of a typical McConnell’s picture, the mechanism behind this paradoxical pattern is not clearly understood. One of the previous studies hypothesized that the differences between the present case and a typical McConnell’s picture may be due to regional differences in RV myocardial ischemia as a result of the massive PE. Although this is certainly possible, these differences may also simply be another manifestation of the increased stress placed on the right ventricle due to the acute increased pulmonary vascular resistance.

In addition, this pattern of RV apical akinesis closely resembles that of takotsubo syndrome of the right ventricle. Although takotsubo is normally characterized with sole dysfunction of the left ventricle, this syndrome can present with both mixed RV and left ventricular...
involvement in about 25% of patients or rarely can present in unique cases with RV dysfunction alone. Although the exact etiology of takotsubo syndrome is unknown, it is characteristically identified as being triggered by severe emotional or physical stress, and studies suggest that increased sympathetic hyperactivity leads to myocardial stunning and contractile dysfunction in these patients. Similarities have often been drawn between McConnell’s syndrome and inverted takotsubo syndrome in the literature, but the connection between the two has not been completely elucidated. Given the near identical RV findings seen on echocardiography in our patient to takotsubo syndrome of the right ventricle, this strengthens the argument that there may be similarities between these two disease processes. It also suggests that a similar effect of sympathetic hyperactivity may have led to the dysfunction seen in this case.

CONCLUSION

Even though the cause of the regional dysfunction seen in this case has not been completely elucidated, it is important to recognize this pattern of RV heart strain on echocardiography. McConnell’s sign has arguably a fairly high specificity for diagnosing massive PE on TTE, but it is not always capable of identifying those with this disease. The paradoxical pattern seen in this case, in which the apical and distal regions of the RV free wall were akinetic and the basal to middle portion was hyperkinetic, is also indicative of a massive PE and should be additionally considered along with McConnell’s sign when evaluating patients for this condition.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2018.07.012.

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