Differences in Negative T Waves Between Acute Pulmonary Embolism and Acute Coronary Syndrome

To the Editor:

Kosuge et al¹ compared the negative T wave (Neg T) patterns of 107 acute pulmonary embolism (APE) patients and 248 acute coronary syndrome (ACS) patients. They concluded that “the presence of Neg T in leads III and V1 and/or peak Neg T in leads V1–2 simply but accurately differentiates APE from ACS.” This is an important and oft-cited article, especially in that online ECG and free online medical education resources² that have become increasingly popular among medical professionals worldwide.

The authors report that of the 107 APE patients, 76% had both ECG patterns (Neg T in leads III and V1 in addition to peak Neg T in V1/V2), whereas 22% had either pattern alone. Their table 3 and the ensuing discussion give the impression that either ECG pattern in isolation is a useful discriminant (both with sensitivity 87%, specificity 96%, positive predictive value of 89%, and negative predictive value of 94%). However, most APE patients in the study had both ECG patterns, and based on our analysis of the data reported in table 3, 11% of patients with APE and 4% of patients with ACS had 1 pattern but not the other. Thus, the positive predictive value for APE of either ECG finding alone was 55% and the negative predictive value was 71%. Positive likelihood ratio for either ECG finding alone was 2.75, and negative likelihood ratio was 0.85. As both this and an earlier study by Kosuge et al³ showed overall greater prevalence of ACS presenting with precordial Neg T waves, the appropriate conclusion is that

if only 1 of the patterns is present, the ECG has not meaningfully discriminated between APE and ACS.

However, although not explicitly reported, it appears that the presence of *both* ECG patterns, which occurred in 76% of APE cases and apparently 0 of the ACS cases, can provide an important discriminatory function because it would have an exceedingly high positive predictive value and positive likelihood ratio. In other words, if neither pattern is present, APE is highly unlikely; if both are present, APE would be highly favored over ACS; and if either is present in isolation (Neg T in leads III and V1 *or* peak Neg T in V1/V2), the pretest probability of APE vs. ACS has not been altered to a significant degree.

Disclosures

None.

References

1. Kosuge M, Ebina T, Hibi K, Tsukahara K, Iwahashi N, Umemura S, et al. Differences in negative T waves between acute pulmonary embolism and acute coronary syndrome. *Circ J* 2014; **78**: 483–489.
2. Farkas J. Two EKG patterns of pulmonary embolism which mimic MI. *PULMCrit (EMCrit)* 30 July 2014. <https://emcrit.org/pulmcrit/two-ekg-patterns-of-pulmonary-embolism-which-mimic-mi/> (accessed May 10, 2021).
3. Kosuge M, Ebina T, Hibi K, Tsukahara K, Iwahashi N, Gohbara M, et al. Differences in negative T waves among acute coronary syndrome, acute pulmonary embolism, and Takotsubo cardiomyopathy. *Eur Heart J Acute Cardiovasc Care* 2012; **1**: 349–357.

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