EDITORIAL COMMENT

Triple Rule Out CTA Scans or the Right Test for the Right Patient*

Judd E. Hollander, MD,† Anna Marie Chang, MD, MSCE‡

In this issue of *iJACC*, Burris et al. (1) used a state-wide registry to compare the diagnostic yield of coronary computed tomography angiography (CTA) with that of triple rule out (TRO) CTA scans and found that although there were slightly higher diagnostic yields for aortic dissection and pulmonary embolisms (PEs) in the TRO CTA group, this came at the cost of a higher dose of radiation and contrast exposure. This is the largest dataset to compare TRO CTA with coronary CTA and confirm the results of smaller studies and systematic reviews (2–5). However, as a comparative effectiveness study, the reader is unable to assess how clinicians decided which test to order or what institutional protocols existed. What disease or diseases were the clinicians trying to rule out? Why did they choose TRO CTA over a dedicated coronary CTA? Was it institutional protocol or provider choice? Furthermore, we do not know how many CTAs were done solely to evaluate for PE or aortic dissection.

SEE PAGE 817

Several questions that are clinically relevant should be raised by this study. Only 1 can really be addressed—whether coronary CTA and TRO CTA have similar diagnostic yields for coronary disease. This is the only disease that coronary CTA is designed to detect. The results of this study confirm that they are similar. Other highly relevant questions are the following: How does TRO CTA compare with pulmonary CTA for the diagnosis of PE? How does TRO CTA

compare with CTA of the aorta for the diagnosis of aortic dissection? Unfortunately, we are no closer to being able to answer those questions.

Despite these concerns, the fundamental question is whether there is a population for which TRO CTA is necessary. Is there really that much confusion about whether someone might have an aortic dissection, PE, or an acute coronary syndrome (or coronary disease)? Risk factor profiles for these conditions are not the same. For example, PEs are more likely to develop in women younger than 55 years of age, whereas aortic dissection is predominantly a disease of white men older than 60 years of age. Although elements of the history and physical examination are unreliable to rule out an acute coronary syndrome, there are clinical decision rules that help us risk stratify these patients (6). Patients younger than 40 years of age without a cardiac history or risk factors and normal findings on an electrocardiogram have a <1% risk of 30-day adverse cardiovascular events (7). The TIMI (Thrombolysis In Myocardial Infarction) risk score, the HEART (History, ECG, Age, Risk Factors, Troponin) score, and the EDACS (Emergency Department Assessment of Chest Pain Score) define a low-risk population in which potential further testing for an acute coronary syndrome may be unnecessary (8–10). For those at low to intermediate risk of an acute coronary syndrome, multiple large cohort studies and randomized, controlled trials have proved the effectiveness of coronary CTA (11–13).

Formal risk assessment or clinical gestalt can help physicians diagnose PE. Kline et al. (14) compared clinician gestalt with machine-derived pre-test probabilities of acute coronary syndrome or PE and found that they were similar. Rules such as PERC (Pulmonary Embolism Rule out Criteria) will allow us to safely exclude the diagnosis of PE (15). Other studies have shown that by using clinical decision rules and a negative D-dimer, clinicians can reliably exclude the diagnosis of PE (16). Although we do not have such robust data for the diagnosis of aortic dissection,

without history and risk factors for aortic dissection, this diagnosis is highly uncommon, with only ~2,000 cases reported in the United States each year. The IRAD (International Registry of Aortic Dissections) only has ~3,800 patients enrolled in nearly 2 decades [17].

Equally important, just because we have the technology does not mean we should be using it. As we have seen with the proliferation of new technology in hospitals, the use of tests has increased. Emergency department use of abdominal CT doubled between 2001 and 2005, yet detection rates for appendicitis, diverticulitis, and gallbladder disease did not increase and admission rates did not decrease [18]. Imaging for atraumatic headache presentations nearly tripled from 1998 to 2008, whereas the diagnosis of intracranial pathology among those visits decreased by almost two-thirds [19]. In a single-center study, Rogg et al. [5] found that only 0.6% of patients underwent testing for acute coronary syndrome, PE, and aortic dissection. There should not be a 20-fold increase in physicians being concerned about the possibility of all 3 of these conditions because the disease prevalence has not changed that drastically.

We need to move away from mandatory testing for every possible disease and move toward testing for serious conditions that the patient may have. We should, of course, do this with the minimal harm to patients. Providers should be able to, in most cases, decide whether they need to rule out coronary disease, PE, or aortic dissection and select the test that will give them the best answer. We know that coronary CTA and TRO CTA are similar with respect to the diagnosis of coronary disease. There is not enough evidence to determine whether TRO compares favorably or unfavorably with dedicated angiography of the pulmonary arteries or the aorta. Until we know that TRO CTA at least meets that bar, we probably should avoid the extra contrast and radiation that come along with it. Let's use the right test for the right patient rather than a 1-test-fits-all approach.

REPRINT REQUESTS AND CORRESPONDENCE: Dr. Judd Hollander, College Building, Suite 300, Department of Emergency Medicine, Thomas Jefferson University, 1025 Walnut Street, Philadelphia, Pennsylvania 19107. E-mail: judd.hollander@jefferson.edu.

REFERENCES

1. Burris AC II, Boura JA, Raff GL, Chinnaiyan KM. Triple rule out versus coronary CT angiography in patients with acute chest pain: results from the ACIC Consortium. J Am Coll Cardiol Img 2015; 8:817–25.

2. Ayaram D, Bellolio MF, Murad MH, et al. Triple rule-out computed tomographic angiography for chest pain: a diagnostic systematic review and meta-analysis. Acad Emerg Med 2013;20:861–71.

3. Gruettner J, Fink C, Walter T, et al. Coronary computed tomography and triple rule out CT in patients with acute chest pain and an intermediate cardiac risk profile. Part 1: impact on patient management. Eur J Radiol 2013;82:100–5.

4. Madder RD, Raff GL, Hickman L, et al. Comparative diagnostic yield and 3-month outcomes of "triple rule-out" and standard protocol coronary CT angiography in the evaluation of acute chest pain. J Cardiovasc Comput Tomogr 2011;5:165–71.

5. Rogg JG, De Neve J-W, Huang C, et al. The triple work-up for emergency department patients with acute chest pain: how often does it occur? J Emerg Med 2011;40:128–34.

6. Swap CJ, Nagurney JT. Value and limitations of chest pain history in the evaluation of patients with suspected acute coronary syndromes. JAMA 2005;294:2623–9.

7. Marsan RJ, Shaver KJ, Sease KL, Shofer FS, Sites FD, Hollander JE. Evaluation of a clinical decision rule for young adult patients with chest pain. Acad Emerg Med 2005;12:26–31.

8. Than M, Flaws D, Sanders S, et al. Development and validation of the Emergency Department Assessment of Chest Pain Score and 2 h accelerated diagnostic protocol. Emerg Med Australas 2014;26:34–44.

9. Visser A, Wolthuis A, Breedveld R, Ter Avest E. HEART score and clinical gestalt have similar diagnostic accuracy for diagnosing ACS in an unselected population of patients with chest pain presenting in the ED. Emerg Med J 2014 Sep 12 [E-pub ahead of print].

10. Chase M, Robey JL, Zogby KE, Sease KL, Shofer FS, Hollander JE. Prospective validation of the Thrombolysis in Myocardial Infarction Risk Score in the emergency department chest pain population. Ann Emerg Med 2006;48:252–9.

11. Litt HI, Gatsonis C, Snyder B, et al. CT angiography for safe discharge of patients with possible acute coronary syndromes. N Engl J Med 2012;366:1393–403.

12. Hoffmann U, Truong QA, Schoenfeld DA, et al. Coronary CT angiography versus standard evaluation in acute chest pain. N Engl J Med 2012;367: 299–308.

13. Min JK, Dunning A, Lin FY, et al. Age- and sex-related differences in all-cause mortality risk based on coronary computed tomography angiography findings results from the International Multicenter CONFIRM (Coronary CT Angiography Evaluation for Clinical Outcomes: An International Multicenter Registry) of 23,854 patients without known coronary artery disease. J Am Coll Cardiol 2011;58:849–60.

14. Kline JA, Stubblefield WB. Clinician gestalt estimate of pretest probability for acute coronary syndrome and pulmonary embolism in patients with chest pain and dyspnea. Ann Emerg Med 2014;63:275–80.

15. Kline JA, Courtney DM, Kabrhel C, et al. Prospective multicenter evaluation of the pulmonary embolism rule-out criteria. J Thromb Haemost 2008;6:772–80.

16. Lucassen W, Geersing G-J, Erkens PMG, et al. Clinical decision rules for excluding pulmonary embolism: a meta-analysis. Ann Intern Med 2011; 155:448–60.

17. Hagan PG, Nienaber CA, Isselbacher EM, et al. The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. JAMA 2000;283:897–903.

18. Pines JM. Trends in the rates of radiography use and important diagnoses in emergency department patients with abdominal pain. Med Care 2009;47:782–6.

19. Gilbert JW, Johnson KM, Larkin GL, Moore CL. Atraumatic headache in US emergency departments: recent trends in CT/MRI utilisation and factors associated with severe intracranial pathology. Emerg Med J 2012;29: 576–81.

KEY WORDS acute coronary syndrome, computed tomography, coronary CTA, coronary disease