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Editorial

Coronary Computed Tomographic Angiography in Assessment of Suspected Coronary Artery Disease and Chest Pain in the ER

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The definitive diagnosis of chest pain in the emergency room (ER) is not always easy. The appropriate workup in these cases begins with a skilled assessment of the patient's symptoms and a careful review of history and physical examination, followed by a series of electrocardiograms and measurement of serum biochemical markers such as troponin, BNP, ProBNP and d-dimer.

The differential diagnosis must be both quickly and precisely drafted, and, in a large number of cases, it is difficult to differentiate between the three major life-threatening causes of chest pain [1,2] coronary artery disease (CAD) , acute aortic syndrome, and pulmonary embolism.

The development of newer generations of multidetector computed tomographic (MDCT) scanners, which are capable not only of performing high-quality noninvasive coronary angiography, but also concurrent aortic and pulmonary angiography, has led to the increased use of MDCT for the so-called "triple rule out." This protocol can be very useful and potentially cost effective when used appropriately, specially for patients who present with acute chest pain but are considered to have low to intermediate risk for acute coronary syndrome, and whose chest pain symptoms might also be attributed to acute pathologic conditions of the aorta or pulmonary arteries [3-5]. MDCT should not be used as a routine screening procedure. Its great value is seen when used for resolution of cases with uncertain diagnosis, mainly when these diagnostic doubts can generate easily avoidable iatrogenic circumstances for the patient.

Coronary computed tomographic angiography (CCTA) is a well established tool for noninvasive evaluation of low to moderate risk chest pain. Several studies have demonstrated the efficacy and safety of this examination to discard CAD in symptomatic patient and, in most cases, it is - at least - as effective as other diagnostic methods such as stress tests and SPECT myocardial perfusion imaging [6-8]. The introduction of CCTA in the ER for evaluating patients with chest pain can reduce the time of in-hospital observation as well as allowing early discharge with greater security [6,8-10]. In addition, within the public service, a complete evaluation and risk stratification in one hospital and the definition of which patient really needs specialized treatment can help to reduce the high demand for outpatient consultations and cardiac tests [11,12].

The findings from the PROMISE [13] (Multicenter Imaging Study for Evaluation of Chest Pain) trial show that CCTA is a viable alternative to functional stress testing to assess symptomatic, intermediate risk patients, i.e., for whom the latter is currently recommended. They also support the expanded use of CCTA as an equally effective and safe procedure for patients presenting with suspected heart disease. As a matter of fact, an initial strategy with CCTA was associated with a significant lower rate of invasive catheterization without obstructive CAD (28%) compared to a functional strategy with stress test that demonstrated 52% of invasive catheterization without obstructive CAD. This study can significantly impact daily clinical practice, with the potential to reduce the number of unnecessary invasive angiograms, stress tests and other resource-intensive procedures. Interestingly, there was also a significant early benefit of the CCTA strategy over functional imaging for decreasing hard events (death or non-fatal MI) in 12 months.

On the other hand, the SCOT-HEART [14,15] (CT coronary angiography in patients with suspected angina due to coronary heart disease) trial reported encouraging findings about the effectiveness of CCTA compared to conventional stress testing since it demonstrated that CCTA provided a clearer and more precise diagnosis of CAD, reclassifying the diagnosis in one of every 4 patients. The use of CCTA led to changes in treatment strategies, resulting in a 38% reduction on CAD death and non-fatal myocardial infarction (MI) when compared to the standard of care. Although this fell just short of statistical significance, the findings are promising, yet they need to be confirmed by longer term follow-up. CCTA was also associated with an impressive 38% reduction in MI. Although this reached borderline statistical significance, it supports the likelihood that CCTA can identify high risk plaque that may be a harbinger of an acute coronary event [16,17].

One of the most important conclusions in the Scottish trial is that median radiation dose for CCTA was only 4.1 mSv, continuing the rapidly accelerating downward trend thanks to technological advances and rigorous professional training. Wherein the latest software and hardware updates have achieved even lower radiation levels downstream 1 mSv (or lower) target.

In summary, for the evaluation of suspected acute coronary syndrome SCOT HEART and PROMISE provide compelling evidence that CCTA should be part of the everyday testing armamentarium for evaluating patients with low to intermediate risk. These results provide persuading evidence to review coverage and medical necessity decision rules: CCTA is of high clinical value in identifying high risk plaque, determining the existence (and severity) of coronary stenosis, and improving clinical outcomes of symptomatic patients. On the other hand with technical improvements in acquisition speed and spatial resolution of computed tomography images, and development of more efficient image reconstruction algorithms which reduce patient exposure to radiation and contrast, may result in increased popularity of MDCT for "triple rule-out."

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