"Triple Rule-Out": Including the Abdominal Aorta With a Clear Conscience?

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Short Editorial related to the article: Conventional and Partially ECG-Gated Triple Rule-Out Computed Tomography Angiography with Extension to Abdominal Aorta: Comparative Radiation Dose and Imaging Quality

The triple rule-out computed tomography angiography (TRO CTA) has been established as a valuable tool in the emergency care of patients with chest pain.[1,2] By allowing simultaneous assessment of the coronary arteries, thoracic aorta, and pulmonary arteries, this approach provides high diagnostic value, particularly in patients at low to intermediate risk of acute coronary syndrome, aortic dissection, and pulmonary thromboembolism. However, the main criticism of TRO CTA remains its significant radiation exposure,[3] especially when retrospective electrocardiographic synchronization techniques are used.

The study by Bertolazzi et al.[4] published in this issue contributes to this debate by comparing two TRO CTA protocols that include an extension to the abdominal aorta – one fully synchronized with the electrocardiogram (ECG) and a second partially (in chest images only) synchronized with the ECG. Although simple, the hypothesis is clinically relevant: would it be possible to maintain diagnostic image quality while significantly reducing radiation exposure with a partially ECG-synchronized protocol?

Less is More – Less Radiation Dose, More Patient Safety

The main strength of the study lies in its methodological approach. The authors selected patients who had previously undergone the TRO CTA protocol including the abdominal aorta with full electrocardiographic synchronization. After obtaining consent, they performed a new examination using the partial electrocardiographic synchronization protocol, enabling a robust comparison through a "matched case-control" model. This approach minimizes bias related to anatomical and technical variability among different individuals.

The results were interesting. The dose reduction was significant: the mean effective dose of the protocol with partial ECG synchronization was 47.9% lower than that of the protocol with full synchronization (17.0 mSv vs. 32.6 mSv, $p<0.001$). It is noteworthy that this reduction in radiation dose was not accompanied by a compromise in image quality. The quantitative assessment of attenuation values in critical vascular regions – such as the ascending aorta, descending aorta, abdominal aorta, and pulmonary trunk – showed no statistically significant differences. Similarly, the subjective qualitative evaluation demonstrated equivalence between the two protocols in terms of image quality of the assessed anatomical structures.

The present study also stands out for including the abdominal aorta in the acquisition, which is not commonly reported in previous publications on TRO CTA. This is particularly relevant as it expands the clinical utility of the exam by allowing a complete evaluation of the aorta when there is suspicion of descending dissections or abdominal involvement – a considerable diagnostic benefit, especially in emergency settings. At this point, however, a comment is warranted: although technically feasible and clinically useful, the TRO CTA protocol with extension to the abdominal aorta should be indicated with caution. The rational use of diagnostic resources should always guide our decisions. An examination evaluating multiple vascular territories, as presented, is only justified when there is clinical uncertainty or a real need to investigate all these segments. In other words, the fact that we can see more, with less radiation, does not mean we should always see everything.

Impact on clinical practice and future perspectives

The implementation of hybrid protocols with partial ECG synchronization represents a realistic and accessible alternative for institutions seeking to optimize their diagnostic workflows with safety and reduced radiation exposure. The study proposes a technical acquisition model that can be replicated by institutions already using TRO CTA and wishing to extend anatomical coverage without proportionally increasing radiation burden. The approach seems accessible and feasible for centers with 'intermediate' CT scanners, available in most major urban centers. Furthermore, the reduced radiation dose protocol should not negatively impact patient flow, exam execution time, or image reconstruction and post-processing times compared to the conventional strategy.

Despite the clear benefit of radiation dose reduction, the future calls for cost-effectiveness and clinical outcome evaluations.[5] While image quality and dose reduction are fundamental, the impact of this protocol in terms of accuracy and cost-effectiveness in real clinical scenarios must be validated in larger cohorts and multicenter studies. As a scientific and clinical community, we must foster discussions and studies that expand this line of investigation, promoting the development of optimized examination protocols that lead to safer and more efficient clinical decisions.

Keywords

X-Ray Computed Tomography; Angiography; Patient Safety

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