Letters

TO THE EDITOR

Pitfalls of Noninvasive Discrimination Between Coronary Chronic Total Occlusion and Subtotal Occlusion by Coronary Computed Tomography Angiography

We read with interest the paper by Choi et al. (1) regarding noninvasive discrimination of coronary chronic total occlusion (CTO) and subtotal occlusion (STO) by coronary computed tomography angiography (CTA). We recognize the potential clinical relevance of the noninvasive differentiation between these 2 entities because CTO usually involves a worse prognosis and more technical challenges in recanalization (2). However, we have some concerns regarding the methodological approach used in this study.

First, in the paper by Choi et al. (1), patients with a diagnosis of complete absence of luminal enhancement on coronary CTA (irrespective of the length of the occluded segment reaching up to 30 mm) were included. However, a previous CT study showed that lesions with an occlusion length \( \geq 14.3 \) mm are very likely to represent CTO (3), whereas short interruptions of the contrast opacification constitute a major diagnostic puzzle for most of the clinicians interpreting CTA results. In this regard, the possibility of a potential selection bias with inclusion of some proportion of "straightforward" CTO lesions cannot be discounted. Consequently, this approach may artificially increase the sensitivity because there are more "true positive" cases than in a more confined subset of shorter CTO lesions with a challenging diagnosis on CTA. In our opinion, the incremental diagnostic yield of noninvasive CTA is related to the evaluation of coronary lesions with short interruption of the luminal enhancement that visually accounts for most of the diagnostic dilemmas in clinical practice.

A second aspect is the validation of the primary model for prediction of the procedural outcome of recanalization defined as successful percutaneous coronary intervention with a minimal diameter stenosis <50% and Thrombolysis In Myocardial Infarction grade flow grade 3. The disadvantage of this endpoint is that it provides a close dependence on all aspects of the percutaneous procedure (i.e., guidewire crossing, balloon pre-dilation, and stent implantation) that heavily rely on the individual operator's skills, experience, and perseverance rather than the level of difficulty intrinsic to treating the lesions. A potential solution for this issue had already been applied in the recent CT-RECTOR (Computed Tomography Registry of Chronic Total Occlusion Revascularization) registry that defined the outcome variable as the ability to successfully cross the lesion with a guidewire within 30 min (4).

Third, the results of the study by Choi et al. should be interpreted with reference to the risk of bias regarding flow and timing. Indeed, the presence of coronary plaque is not a static phenomenon—a lesion may appear high-grade stenotic today but rather evolve into CTO tomorrow, and vice versa. In this context, the interval between coronary CTA and invasive angiography that extended up to 12 weeks in the study by Choi et al. (1) was perhaps too long. This issue is further complicated because patients with recent myocardial infarction (occurring within 90 days by the CTA time) were excluded, which, together with the delayed invasive coronary angiography, might have favored enrollment of older CTO.

These comments may be important when interpreting the results of the study by Choi et al. (1).

*Maksymilian P. Opolski, MD
Adam D. Staruch, MD
Damini Dey, PhD
*Department of Interventional Cardiology and Angiology
Institute of Cardiology
Alpejska 42
Warsaw 04628
Poland
E-mail: opolski.mp@gmail.com
http://dx.doi.org/10.1016/j.jcin.2015.09.014

Please note: The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

REFERENCES

Letters to the Editor

We thank Drs. Opolski and colleagues for their interest in our paper (1). Historically, chronic total occlusion (CTO) has been defined by complete luminal obstruction with presumed duration ≥3 months. However, this definition is frequently troubled by limited spatial resolution of angiography and unclear medical history.

Revisiting the definition of CTO on the basis of the presumed pathogenesis of CTO, starting as thrombotic occlusion in the context of myocardial infarction, followed by progression of organized thrombus filling up to the ostium of side branches and growth of collateral vessels flowing into the distal arterial tree (2–4), may clarify the definition of CTO. Coronary computed tomography angiography could reveal these pathophysiological findings, which were more common in CTO compared with subtotal occlusion (STO) (1). Matured CTO would be pathologically and hemodynamically stabilized plaque and may not regress or progress in a short-term period. STO can be regarded as having a dynamic status in the spectrum between thrombotic occlusion and matured CTO.

In brief, CTO is an interbifurcation occlusive disease. The length of occlusion depends on the distance between branches and is highly various. Typically, CTO in the right coronary artery is longer compared with CTO in left coronary arteries. Therefore, length is neither sensitive nor specific for CTO. The J-CTO (Multicenter CTO Registry in Japan) and CT-RECTOR (Computed Tomography Registry of Chronic Total Occlusion Revascularization) studies focused on the grading difficulty of CTO by angiographic or coronary computed tomography angiography–based score (5). Occlusion length ≥20 mm was found in just 9% of successfully revascularized patients in the J-CTO and CT-RECTOR studies, respectively. Unlike J-CTO, lesion length was not included in CT-RECTOR.

Crossing a guidewire through CTO is the most time-consuming step and is highly dependent on the operator’s expertise, which has been used as the primary outcome in the previously mentioned studies (5). Although crossing a guidewire resulted in successful revascularization in most cases, clinically meaningful guidewire crossing into the distal vessel should be validated only after dilation of the occluded segment by a balloon or stent and confirmation of flow restoration in the distal arterial bed. We focused on discerning CTO from STO, in which the guidewire usually crossed the lesion within 1 min. Such a straightforward lesion subset needs to be considered separately from technically demanding CTO in both procedural and clinical aspects.

*Jin-Ho Choi, MD, PhD
Kim Eunkyung, MD
*Department of Emergency Medicine
Samsung Medical Center
Sungkyunkwan University School of Medicine
81 Irwon-Ro Gangnam-gu
Seoul 135-710
Republic of Korea
E-mail: jhchoimd@gmail.com
http://dx.doi.org/10.1016/j.jcin.2015.10.002

Please note: The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

REFERENCES