LM-MLA cutoff value should be prospectively validated. In the LITRO (4), a prospective multicenter study including 354 patients, the 6-mm^2 cutoff value was clinically validated. At 2 years, the outcome of deferred patients was equivalent to that of the revascularized group. Importantly, the outcome of the few patients with 5- to 6-mm^2 LM-MLA who did not undergo revascularization was significantly worse. Last but not least, the LM-MLA cutoff value is just aimed to exclude the presence of current ischemia. However, 36% of patients in the study by Park et al. (1) with "isolated" LM disease presented as an acute coronary syndrome, and on intravascular ultrasound, plaque ruptures (30.6%) and intracoronary thrombi (33.3%) were readily observed. It is difficult to believe that the fate of these unstable plaques may be only dictated by the hemodynamic significance encountered at the time of the examination.

We strongly believe that the provocative proposal of 4.5 mm^2 as an LM-MLA optimal cutoff value should be taken very cautiously until further clinical data support its prognostic validity.

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REPLY: The Optimal Cutoff Value for Left Main Minimal Lumen Area of 4.5 mm^2: A Word of Caution

We thank Dr. de la Torre Hernández and colleagues for their interest in our paper (1) suggesting the optimal left main coronary artery minimal lumen area (LM-MLA) of 4.5 mm^2 for detecting fractional flow reserve (FFR) $<$0.80.

First, the Jasti et al. (2) study with a small sample size (N $=$ 55) reporting an LM-MLA cutoff value of 5.9 mm^2 enrolled patients with lesions with downstream disease of the LM branches; 58% were distal LM lesions usually extending to the side-branch ostia, which made assessing how the LM-MLA itself affects the hemodynamic significance unreliable. Moreover, they included only a few patients with an MLA of 4.5 to 6.0 mm^2. The lesions mostly had a large lumen, with 75% having a negative FFR. Conversely, our study (N $=$ 112) included only ostial and shaft lesions: 34 patients with an LM-MLA of 4.5 to 6.0 mm^2 and more ischemia-inducing lesions and 59% with positive FFR ($<$0.80). That is the main difference in our study. The ethnic differences poorly supported the relevance of using the larger LM-MLA criterion. Rusinova et al. (3) reported a smaller LM-MLA in Asian patients, whereas the vessel area was greater in Asian compared with North American patients (20.7 $\pm$ 4.5 mm^2 vs. 19.3 $\pm$ 4.2 mm^2, p $=$ 0.024).

Second, the suboptimal accuracy of the LM-MLA is not surprising. Even in isolated LM lesions, the FFR was determined not only by the LM-MLA but also by various clinical and lesion-specific local factors (age, body mass index, left ventricular mass, and the presence of plaque rupture) (1). In patients with an LM-MLA $>$4.5 mm^2, the FFR was $<$0.80 in 24%, but $<$0.75 in only 9%. However, 36% of the patients with an LM-MLA $<$6.0 mm^2 showed an FFR $>$0.80, and they are at risk of undergoing unnecessary treatment.

Third, if an MLA of 3.0 mm^2 for the left anterior descending artery and 2.7 mm^2 for the left circumflex artery are assumed to be ischemic thresholds, clearly the LM-MLA is 4.5 mm^2 (Murray's law) (1).

Fourth, in the LITRO trial (4), 16 of the 168 patients with an LM MLA $<$6 mm^2 did not undergo revascularization. They had an LM-MLA of 5.0 to 6.0 mm^2 and had complex lesion morphology for PCI, high surgical risk, old age, and multiple comorbidities. The worse

JACC: CARDIOVASCULAR INTERVENTIONS VOL. 8, NO. 1, 2015
JANUARY 2015:119–27

outcome in those ineligible for the protocol could not represent the general population.

Finally, no evidence-based criteria warrant revascularization for vulnerable lesions without ischemia. The FFR is the most sensitive index of ischemia in all clinical settings except ST-segment elevation myocardial infarction. Thus, LM-MLA may be useful to aid in decision making as to whether to treat, but choose the cutoff value wisely! If you still doubt about objective ischemia, please use the FFR!

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Intracardiac Echocardiographic Imaging of the Left Atrial Appendage and Detection of a Peridevice Leak After Device Occlusion

We read with great interest the report by Berti et al. (1). We agree with their view point that intracardiac echocardiography (ICE) imaging can perform the tasks typically provided by transesophageal echocardiography (TEE) during transcatheter occlusion of the left atrial (LA) appendage (LAA). Although the authors presented utility and safety assessment of ICE-guided percutaneous LAA device closure (Amplatzer cardiac plug) in a relatively large cohort of 120 patients, there were several issues in methodology that need to be clarified and discussed.

Ideal ICE imaging views and accurate measurement of the LAA anatomy including the ostium, short- and long-axes, and the landing zone are critically important for proper sizing and delivery. Although they failed to present a uniform ICE examination protocol, they describe imaging the LAA with the transducer in the right atrium (RA) and coronary sinus (CS). In majority of the atrial fibrillation patients with LA enlargement, the RA transducer view does not provide anatomically detailed LAA imaging with sufficient resolution due to far-zone imaging features. The authors try to argue against this with a “best example” figure (Figure 2 [1]), but it appears that the transducer in this figure is actually in the LA because the interatrial septum is not imaged. In addition, when imaging from the CS, the LAA is often truncated, and it is difficult to obtain an ideal LAA ostium and LAA long-axis image due to the limited potential for transducer manipulation in the narrow CS lumen.

In our experience using ICE for cardiac diagnosis and left heart ablation in more than 3,000 cases, specific imaging views routinely provide important LAA anatomic features as part of a complete assessment (2). A transverse long-axis image of LAA with its orifice can be typically obtained with the transducer placed in the right ventricular outflow tract (RVOT). This imaging view is especially helpful for anatomic assessment and LAA size measurements (**Figure 1A**). Close-up imaging using higher ultrasonic frequency can be obtained with the transducer placed in the pulmonary artery (PA). These imaging views are especially helpful for differentiation of thrombus from variant pectinate muscles/sluggish flow and to properly image/measure LAA emptying flow (**Figure 1B**). Peripheral LAA-left ventricle imaging views can also be obtained with the transducer placed in PA for close-up evaluation of lobes and pectinate muscles (2). Therefore, the best view for measurement of the anatomy of the LAA is the ICE transducer placed in the RVOT. The LAA ostium is usually measured from the LAA junction with the upper left pulmonary vein (ULPV) ostium to the junction of the LA and LAA (**Figure 1A**). The landing-zone diameter can be accurately determined with a certain distance to the ostium. In addition, this view also provides the best imaging to guide proper sheath/device placement in the LA to LAA ostium, much better than the ideal lobe for sheath placement that was decided on based on fluoroscopic images indicated by the authors (1).

Another important issue is to evaluate/eliminate any peridevice leak immediately after device