inspected for superficial hemostasis. Angiography is repeated to demonstrate vessel patency and hemostasis. All balloons, wires, and catheters are removed in standard fashion. A single skin stitch is placed at the left axillary puncture site using 3-0 Vicryl (Ethicon, Somerville, New Jersey), and the area is covered with Steri-Strips (3M, Minneapolis, Minnesota) (Online Figure 5C).

In our preliminary experience with percutaneous access of the axillary artery, suture closure has been very successful as confirmed by completion angiography. One patient had mild residual contrast extravasation noted at the arteriotomy following explantation and was treated with 2 min of balloon tamponade to achieve hemostasis. In another case, regaining wire access to the vessel was unsuccessful, and a covered stent graft was used.

We have successfully implanted the Impella CP via the direct percutaneous transaxillary technique described in 8 patients (7 via the left and 1 via the right axillary artery). There were no unsuccessful attempts. The duration of support ranged from 1 to 22 days. In 4 patients, explantation was eventually indicated and achieved percutaneously without complications. For the other patients, 1 proceeded to heart transplantation (with Impella explant at that time), and 3 died prior to removal. (For patient descriptions, see Online Table 1).

No neurovascular complications were noted in the upper extremity in any of our cases. No access-related hematomas were noted. All patients who received Impella support for >1 day participated in physical therapy. For some, this included walking while pushing the Impella console. We found device position to be quite stable, with little evidence of migration, even in patients who were maintained on the Impella for >2 weeks. Additionally, we did not see any evidence of early or late insult to the brachial plexus, which is consistent with national experience accessing the subclavian vein for central venous catheters (2).

We have described a technique for percutaneous implantation and explantation of the Impella CP device using a left or right transaxillary approach that is both safe and feasible, even in critically ill patients. This technique presents multiple clinical advantages over traditional femoral access, as highlighted here. To the best of our knowledge, ours is the first technical description illustrating a fully percutaneous transaxillary technique using the Impella CP device. Further work is needed in this domain with a larger patient population to demonstrate the safety profile and clinical advantages of our technique.

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APPENDIX For supplemental figures and a table, please see the online version of this article.

Does Chronic Total Occlusion Percutaneous Coronary Intervention Improve Survival

A Never-Ending Debate

We read with great interest the article by Lee et al. (1), who found no long-term survival benefit of successful chronic total occlusion (CTO) percutaneous coronary intervention (PCI) in their well-performed single-center cohort study. Several observations need to be made.

The incidence of prior coronary artery bypass graft in their population was 2.8%, ejection fraction was mostly normal (only 3.8% of patients had values <40%), mean CTO length was <20 mm, and retrograde PCI was successful in only 8.5%. Although the Japanese-CTO (J-CTO) score was not calculated, these data indicate that the population treated by Lee et al. is quite selected. Additionally, because patient inclusion spanned 11 years (2003 to 2014), the techniques used in this study are not representative of contemporary CTO PCI based on the "hybrid algorithm." For example, in the all-comer PROGRESS-CTO (Prospective Global Registry for the Study of Chronic Total Occlusion Intervention) registry (2), mean

occlusion length was 37 ± 25 mm, mean J-CTO score among successful versus failed CTO PCIs was 2.5 ± 1.2 versus 3.3 ± 1.0, and final successful crossing strategy was the retrograde approach in 28% of cases. Therefore, Lee et al. (1) might have selected a low-risk CTO population, which might explain why they found no association between successful revascularization and survival.

Another explanation might stem from the fact that "almost complete" revascularization (all lesions excluding the CTO) was achieved in 71% of unsuccessful CTO PCI patients. Additionally, coronary artery bypass graft was performed in 17% of these patients during follow-up. This can further confound the analyses, since the failed CTO PCI group actually included a relevant number of successfully (and completely) revascularized patients. Complete and "reasonably incomplete" revascularization has been associated with improved survival (3). Further speculations are hampered by the lack of assessment of the SYNTAX(Synergy Between PCI With Taxus and Cardiac Surgery) and residual SYNTAX score in the study by Lee et al. (1), as well as the fact that they did not provide a definition of complete revascularization.

Finally, their results contrast with those of much larger multicenter registries, which observed improved survival when successful CTO revascularization is achieved. George et al. (4) studied 13,443 patients who underwent CTO PCI and found that successful PCI was associated with improved survival after a median follow-up of 2.65 years.

The final answer to the neverending debate about the possible survival benefit of CTO PCI will not likely come from observational studies. Well-designed and adequately powered randomized trials are eagerly awaited.

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REPLY: Does Chronic Total Occlusion Percutaneous Coronary Intervention Improve Survival

A Never-Ending Debate

We thank Dr. Azzalini and colleagues for their comments concerning our article (1).

Perhaps, among various registries intended for percutaneous coronary intervention (PCI) studies, chronic total occlusion (CTO) registries may have the most extreme form of biased sampling. CTO is more common in the presence of other significantly narrowed coronary artery and a substantial portion of these patients may be excluded due to referral for bypass surgery. Accordingly, registries from experienced centers may include patients with more complex clinical and angiographic characteristics that may affect outcomes. However, the issue pointed out by Azzalini and colleagues should be interpreted from a different viewpoint. The independent variables of Japanese-CTO (J-CTO) score represent the "lesion" complexity, and thus the scoring system predicts procedural efficiency (i.e., guidewire crossing time of <30 min) as well as the probability of overall success. The overall retrograde attempt rate was low, correctly because of the long enrollment period of the study (the first retrograde case was performed in 2008 at our institution). But similarly, retrograde technique and systematic algorithmic strategy both represents the contemporary CTO-PCI, which puts emphasis on procedural efficiency and success. Therefore, several numbers shown in our report, which implies relatively less complex anatomic substrate for CTO lesion itself, might explain why the overall success rate was high, but does not explain why we could not find the association between CTO recanalization and improved survival.

To ultimately answer the title question proposed by Dr. Azzalini and colleagues, several methodological