TABLE 1 Useful Devices in Transradial Superficial Femoral Artery Interventions in the United States

6-F, 125-cm multipurpose guiding catheter (Cordis, Miami Lakes, Florida), which functions as a long 5-F slender sheath
6-F, 120- and 150-cm straight-tip slender sheaths (Terumo, Tokyo, Japan)
Guidewires: 450-cm, 0.035-inch stiff-shaft and soft-shaft Glidewires (Terumo); 475-cm, 0.014-inch Viper guidewire (Cardiovascular Systems, New Brighton, Minnesota)
Balloons: 200-cm, 0.035-inch monorail balloons (Terumo); 200-cm, 0.014-inch monorail balloons (Bard, Tempe, Arizona); 180-cm, 0.018-inch over-the-wire balloons (Pacific Plus, Medtronic, Minneapolis, Minnesota)
Atherectomy: 220-cm orbital atherectomy catheter (1.25-, 1.5-, and 1.75-mm burrs) (Cardiovascular Systems)

access. In fact, in our reports of the combined radial-pedal access strategy, 9 of 17 patients required reverse controlled antegrade-retrograde tracking (2,3,5). We try to limit the use of tibiopedal access and the potential injury of small, calcified tibiopedal arteries, especially in patients with single-vessel runoff. This gains additional importance during a radial-pedal strategy because the tibiopedal access often becomes the primary device delivery access, generally mandating a 5-F slender pedal sheath.

In complex SFA occlusions with favorable antegrade crossing features, we prefer a transfemoral approach and, if needed, a transfemoral re-entry device or a combined femoral-pedal strategy. In the latter case, a 2.9-F pedal sheath may suffice.

Second, the investigators mentioned the use of a 6-F pedal sheath. We do not place pedal sheaths larger than 4-F or 5-F slender. The latter sheaths allow delivery of crossing devices, most atherectomy devices, drug-coated balloons, and specific stent brands. Self-expanding stents may also be delivered sheathlessly.

Third, the investigators did not comment on the length of the guidewires used across the SFA. Guidewires ≥400 cm in length are ideally required for safe device exchanges during transradial SFA procedures. The investigators did not comment on the transradial use of support catheters, and we surmise that they used the 180-cm, 0.018-inch balloon catheter to support crossing. This represents a limitation of transradial recanalization, as the frequently required 0.035-inch catheters are available only in 150-cm length.

Finally, we list devices available in the United States that may be used in stand-alone transradial SFA recanalization (**Table 1**). As we previously described, the left radial-to-distal SFA distance grossly approximates the patient's height; this helps with procedural planning (4).

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REPLY: Superficial Femoral Artery Recanalization Via a Transradial Access or a Combined Radial-Pedal Access Strategy

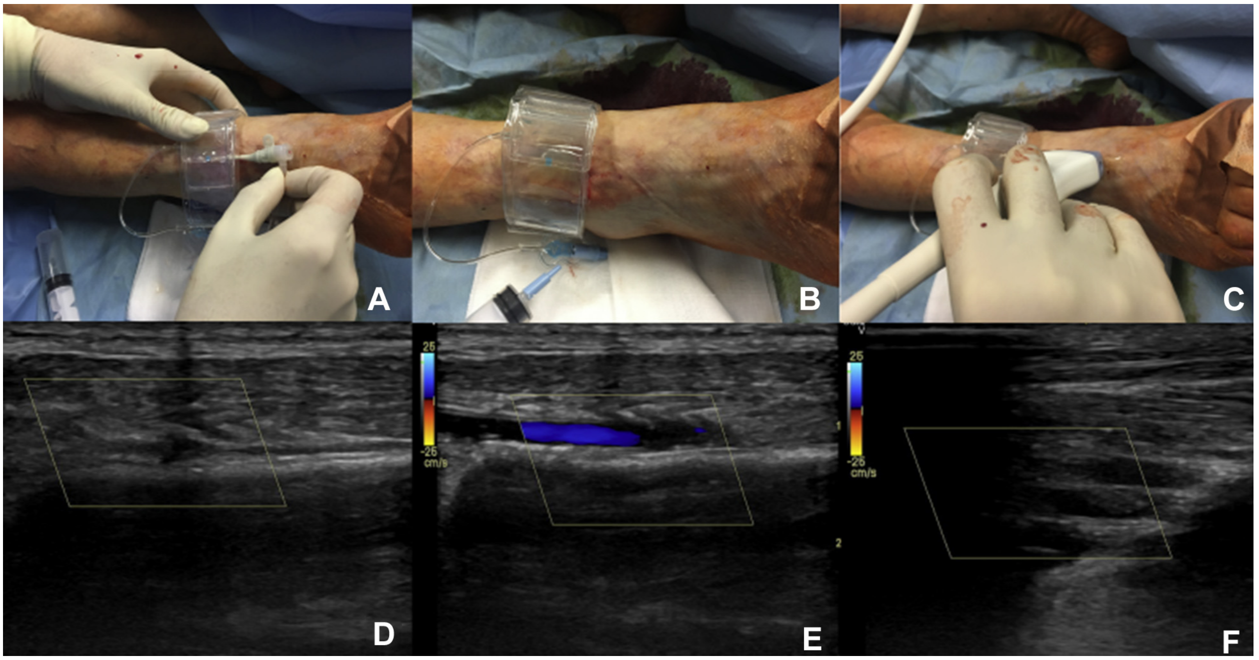
We would like to thank you for the opportunity to respond to the comments by Drs. Hanna and Prout concerning our paper (1).

Combined transfemoral and transpedal approach first has been published as a "bail out" strategy during failed anterograde recanalizations (2), but in cases when the femoral access is not possible or it carries high risk, many authors have suggested the radial-pedal approach for femoral artery interventions (1).

Currently, we use the radial-pedal approach as a primary access method, not only in patients with unfavorable femoral access. Femoral is the secondary access site, which is utilized in patients with difficult puncture or device passage. Difficult puncture can be prevented with routine vascular ultrasound examination (nonpalpable or severely calcified radial artery, radial artery tortuosity, radial artery loop).

Many companies have developed special transradial devices with a long delivery system. In our study population, a 260- to 300-cm-long 0.018-inch

FIGURE 1 Patent Hemostasis During Transpedal Interventions



(A) The transpedal sheath is retrieved after applying the TR Band. **(B)** The inflated TR Band at the puncture site. **(C)** Checking the patency of the flow below the TR Band. **(D)** There is no distal flow in the anterior tibial artery due to the high compression pressure. **(E)** The flow is patent after relieving the pressure. **(F)** The artery is patent just before the TR Band.

guidewire and a Pacific Extreme balloon (Medtronic, Minneapolis, Minnesota) with a 180-cm-long shaft was used for angioplasty. For balloon exchange or stenting, the guidewire was exchanged to a 480-cm-long Roadrunner guidewire (Cook Medical, Bloomington, Indiana), or the primary guidewire was used with using the “indeflator technique.” The indeflator was connected to the working channel of the catheter, and after pressure application, the balloon catheter was retrieved.

Dedicated re-entry devices were not used during the study, but in failed anterograde chronic total occlusion cases, the rendezvous technique was used with high technical success. In a recent publication by Patel et al. (3), it was found that femoral artery occlusion treatments were performed with a 74% success rate from transradial access and 54% from transpedal access. Dual-access recanalization was associated with 99% and 96% success rates, respectively. The rate of transpedal complications was zero despite the liberal use of larger sheath size (maximum 6-F) (3). The safety of the transpedal sheath application has been confirmed in many studies (1–3). We also favor the sheathless technique for transpedal balloon dilatation, but for drug-eluting balloon dilatation or stent implantation, we prefer the use of a sheath. We also use ultrasound-based puncture and the smallest pedal sheath that is compatible with the stent, and we use patent hemostasis (Figure 1) using the TR Band (Terumo Corporation, Tokyo, Japan). Final angiography is performed from radial access in all cases.

We agree with Drs. Hanna and Prout that the supply of transradial femoral artery interventional devices is very limited, and hopefully more companies will acknowledge the need for special devices for these less invasive interventions.

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RESEARCH CORRESPONDENCE

Supra-Annular Sizing for Transcatheter Aortic Valve Replacement Candidates With Bicuspid Aortic Valve

Patients with bicuspid aortic valve (BAV) undergoing transcatheter aortic valve replacement (TAVR) may experience suboptimal clinical outcomes (1). This can be the result of inappropriate prosthesis size selection, anatomic difficulties, or technical factors. Altered anatomies in BAV, such as heavily calcified and fibrotic leaflets and commissural fusion, are particularly challenging for prosthesis size selection.

Appropriate valve size selection is pivotal, as it can avoid paravalvular leak, embolization, and patient-prosthesis mismatch, among other complications. The goal of sizing is to optimize the interference between prosthesis and anatomy. Interference is affected by device design (i.e., radial force and conformability) and prosthesis oversizing. Interference occurs at multiple levels across the left ventricular outflow tract, annulus, and leaflets. The majority of this interaction likely occurs within the leaflets (2). In this regard, some investigators have suggested using balloon sizing or measuring the intercommissural distance for transcatheter aortic valve sizing for BAV, but the strategies were not thoroughly studied or were still in a preliminary phase. Here, we propose supra-annular (or "intraleaflet") sizing for prosthesis size selection. In this report, we describe 3 cases of patients with BAV who underwent Lotus valve implantation using supra-annular sizing.

The supra-annular level is located within the aortic root and defined to be somewhere between 4 and 8 mm above the annulus (varying from patient to patient). Locating this level should appreciate the region where the prosthesis will be maximally constrained, typically in areas of bulky or maximal calcification or commissural fusion. When determining the supra-annulus, commissural gaps need to be sealed by the prosthesis. Commissural fusion, either by calcification or fibrosis, may influence the location of commissural gaps and act as a base for sealing against the prosthesis. Bulky calcifications within the sinuses can affect prosthesis expansion and conformability, so it is necessary to anticipate how much space is left for the prosthesis. A perimeter or an area can be circumscribed using the borders of leaflets (calcified or not) and areas of commissural fusion while making sure to seal commissural gaps.

Patient characteristics, pre- and post-TAVR multidetector computed tomographic measurements, and hemodynamic performance at 1-month follow-up are summarized in **Table 1**. The supra-annular measurements were smaller than the "traditional" annulus circumscribed in all cases. All procedures were uneventful.

The purpose of the present case series is to demonstrate the feasibility of performing supra-annular measurements for transcatheter aortic valve sizing in patients with BAV disease. In all cases, the implanted transcatheter aortic valve was smaller in size than suggested by the "traditional" aortic annulus. Furthermore, the degree of paravalvular leak in each case was mild, mild, and none, respectively; mean transprosthetic gradients were $<$20 mm Hg at 1-month follow-up.

Traditionally, oversizing of the prosthesis is in relation to the aortic annulus (3). Oversizing across the leaflets, however, will be greater than that at the annulus because of the "volcanic shape" of the stenotic aortic valve, especially in BAV morphology or in the presence of heavily calcified leaflets. The increased oversizing across the leaflets can be excessive and not appreciated by annular sizing alone. An oversized prosthesis may increase the risk for annular rupture or conduction disturbances, whereas an undersized prosthesis may lead to significant paravalvular leak or prosthesis migration.

In the present case series, we demonstrate the feasibility of supra-annular sizing in patients with BAV morphology using the Lotus valve. It may be reasonable to extend this practice to all patients undergoing TAVR, because all stenotic aortic valves share the "volcanic shape" of valvular opening. Although further studies are needed, supra-annular