ostia and that of the remaining part of the sewing skirt when the angle between the patient's coronary ostia is greater than 170°. This condition can create stenosis at the inflow level, and it is for this reason that we believe the implantation of any kind of stentless bioprosthesis becomes questionable for angles smaller than 130° and greater than 170°, even with larger scalloped porcine sinuses of Valsalva.

Our study shows that the implantation of a Freestyle stentless bioprosthesis according to this modified subcoronary implantation technique gives results concordant with echocardiographic variables of previous studies on the basis of different subcoronary techniques.^{10,11,14} The very low prevalence of residual aortic regurgitation and postoperative effective orifice areas similar to those of other series in which different subcoronary implantation techniques were used demonstrates the safety and effectiveness of our implantation technique. The implantation method we describe here is reproducible, safe at the coronary ostial level, and effective in accommodating variability in angles between human coronary ostia ranging from 130° to 170°. Moreover, the act of excising a longitudinal segment from the porcine aortic sinuses, narrower than that required by other subcoronary implantation techniques, renders our technique comparable with that of a root inclusion technique, despite the eventual risk of coronary ostial stenosis by intimal hyperplasia. Correction of great discrepancies between the aortic anulus and sinotubular junction diameters immediately after the operation and its maintenance over the first postoperative year in our series proves that the patient's aortic root is completely adapted to the physiologic geometry of the porcine aortic root, which retains its shape as in a root inclusion technique. This fact demonstrates that there is no need for reducing the sinotubular junction as formerly proposed when using 3 scalloped stentless bioprostheses, in which the correction of a larger sinotubular junction diameter—present in almost all cases of long-standing aortic stenosis—is mandatory for preventing recurrence of aortic regurgitation caused by poor coaptation and increased stress on the leaflets.¹

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Commentary

This article describes a modification of the subcoronary implant technique for the Freestyle stentless xenograft, which the authors suggest may reduce the risk of native coronary ostial occlusion. The method involves measurement of the angle between the native coronary ostia to prejudge the extent of scalloping the porcine coronary sinuses. The authors state that patients with adverse root anatomy, including low take-off of the native coronary arteries, root calcification, or substantial discrepancy between the anulus and sinotubular junction diameters, were not considered for implantation of the Freestyle valve.

There are a number of criticisms of the article as presented. First, the authors suggest that the original sub-

coronary method attempted to align the porcine commissures with the human commissures. This is untrue, because both the subcoronary and root inclusion techniques oriented the valve strictly according to the relative positions of the porcine and human coronary arteries. In fact, I recommend that scalloping of the Freestyle valve sinuses be performed with the prosthesis already in situ, taking into account that the porcine coronary arteries are always closer together than are the native coronary arteries. In my own series of 240 consecutive bioprosthetic implants with the Freestyle valve, no patient was deemed unsuitable, whatever the native root anatomy, nor were there any coronary ostial complications.

The method described here somewhat overcomplicates the implantation of the Freestyle valve, since visual inspection of the coronary anatomy and appropriate alignment are all that is required. Many surgeons are still hesitant about the use of stentless valves, and techniques that complicate implantation will continue to put them off.

Next, the article does not address the more important aspects of stentless valve implantation. The principal consideration is the relative diameter of the patient's aortic anulus and sinotubular junction. If the sinotubular junction exceeds the anulus diameter by 15%, it is important to tailor the sinotubular junction to prevent prosthetic valve incompetence. This is easily done by taking a narrow wedge from the noncoronary sinus.

In this article, the authors chose a prosthesis according to the largest sizer that would pass through the anulus. In practice, the aim of the Freestyle valve implant is to fill the native aortic sinuses with the porcine prosthesis, so I always choose a valve size one greater than the sizer that passes through the anulus. The next most important issue is the height of the valve cloth under the native right coronary artery. This rim of cloth may

abut onto a low right coronary ostium and partially occlude the left ventricular outflow tract if it is bent under the right coronary artery. I have reoperated on patients with Freestyle valves implanted in other centers because of this problem, which is easily resolved by rotating the cloth into the patient's noncoronary sinus.

The extent to which the Freestyle valve sinuses should be scalloped is debatable. I prefer to scallop only the left and right coronary sinuses, leaving the noncoronary sinus intact. This simplifies implantation and maintains the intercommissural distance between two pillars, thereby preventing distortion. I also prefer to remove virtually all of the porcine left and right coronary sinuses to leave substantial gaps around the native coronary arteries. It is inadvisable to sew glutaraldehyde-preserved tissue too close to native coronary ostia. I also consider the use of biologic glue in the noncoronary sinus to be inadvisable. The combination of an inflow and an outflow suture line prevents periprosthetic leaks, and if an echo-free space is seen between the prosthesis and native aortic wall, it is because the valve has been undersized.

Stentless aortic bioprostheses convey considerable hemodynamic benefit over their stented counterparts, and this is now known to convey survival benefit at 5 years. Consequently, it is paramount that more surgeons adopt the use of these valves. I believe that the difficulties of stentless valve use have been greatly overemphasized. Uncomplicated implantation methods have already achieved excellent results but must be taught carefully in surgical workshops. Practice on pig hearts is no substitute for learning surgical technique in the operating room.

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