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Please note: Dr. Vogel has responded on behalf of the writing committee.

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Does Percutaneous Closure of the Left Atrial Appendage Prevent Stroke in Atrial Fibrillation?

With great interest we read the study by Ostermayer et al. concerning percutaneous left atrial appendage (LAA) occlusion using the PLAATO (percutaneous left atrial appendage transcatheter occlusion) system in 111 patients with atrial fibrillation (AF) (1). Although this technique seems very attractive, several concerns remain.

1. The investigators state that the PLAATO device has been shown to be safe and effective in animal experiments. However, long-term results are still lacking because follow-up data in 6 of 25 dogs of the initial study have not yet been published (2).
2. Transient ischemic attack (TIA) or stroke or embolic risk factors were criteria for patient inclusion. Thus, it remains unclear why only stroke and not TIA was regarded a primary or secondary end point. Were all patients investigated by a neurologist to look for TIA and stroke at the follow-up visits?
3. When assessing angiographically the adequacy of LAA occlusion, why did the researchers use the proximal and not the distal dye flow, which appears to be the more logical approach? Apparently both methods were used, but did they yield the same results? Why was LAA occlusion assessed as "successful" also in cases with "mild" or "trace" leaks? The investigators do not exactly state in how many patients complete LAA occlusion was achieved using the angiographic method.
4. Evaluating the adequacy of LAA occlusion by echocardiography, it again remains unclear why mild and trace leaks were defined as "successful" as it is known from surgical studies that an incompletely occluded LAA may facilitate thrombus formation and eventually embolism. The data do not show in how many cases leak size increased, decreased, or if new leaks developed. Did patients with leaks immediately after the procedure or during follow-up receive oral anticoagulation? Overall, complete LAA occlusion was present in only 35% of patients at one month and 34% at six months, respectively.
5. The 6.6% annual mortality is quite high and exceeds the 4% found in a previous observational AF study (3). An oversized PLAATO device owing to its proximity may impair flow in the circumflex branch of the left coronary artery. Furthermore, the LAA has hemodynamic and endocrine properties, and LAA elimination may aggravate heart failure (4). More de-

tailed information about the cardiac deaths, therefore, would be desirable.

6. Despite "successful" LAA closure, two strokes and three TIAs occurred. Thus, the annual event rate for stroke and TIA is 5.5%. Because AF is associated with a prothrombotic state (5), just by closing the LAA not all sites of thrombus formation are eliminated. In addition, one patient required surgery, and nine procedure-related serious adverse events occurred in seven patients, resulting in a complication rate of 6% to 7%.

Overall, the advantage of the PLAATO system in patients with AF and a contraindication for anticoagulant therapy has not at all been proven. Because long-term results are lacking, PLAATO at present cannot be recommended as an alternative to oral anticoagulation in AF patients.

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REPLY

We appreciate the interest of Dr. Stöllberger and colleagues in transcatheter left atrial appendage (LAA) occlusion using the PLAATO (percutaneous left atrial appendage transcatheter occlusion) system (1). They have raised a number of issues that are answered below.

1. The 12-month results of the remaining six dogs that were still alive at the time the initial animal experience was published confirmed the short-term findings regarding clinical status, and fluoroscopic, echocardiographic, and macroscopic examinations (Nakai T, personal communication, August 28, 2005).
2. The intention of LAA occlusion is stroke prevention in atrial fibrillation (AF) patients who are at high risk for ischemic

stroke. Therefore, it seemed reasonable to determine stroke as a primary end point. Both previous stroke and transient ischemic attack (TIA) are accepted as independent risk factors for stroke. We regarded stroke only as a primary end point because the CHADS₂ index (an acronym for congestive heart failure, hypertension, age >75 years, diabetes mellitus, and stroke or transient ischemic attack) estimates the expected stroke and not TIA rate and because the assessment of stroke compared to TIA is more objective (even though all patients were seen by a neurologist).

- The degree of LAA occlusion after device implantation was evaluated by proximal dye flow. Distal dye injection in the remaining part of the LAA was only performed before device release and not systemically recorded. Although this method provided important information on the ability of the device to close off blood flow from the left atrium, it was not considered exact because its position with attachment to the delivery catheter was not the same as its final "released" position.
- Left atrial appendage occlusion was defined "successful" not only in cases with "absent leak" but also in cases with "mild" or "trace" leak because we considered mild to trace leakage to be too small for possible thrombi to exit the LAA, especially after incorporation of the device into the LAA wall. The degree of occlusion had no influence on a patient's postprocedure medication.
- The primary aim of our present study was to show that LAA occlusion using the PLAATO system can be performed at acceptable risk. Definitive statements regarding annual mortality and stroke prevention cannot be made owing to limited follow-up. Nevertheless, we agree that the mortality was higher in our patient population compared to the mortality of a previously published study (2). Stöllberger et al. showed that increased age was associated with mortality and stroke. Our results confirm these findings. It is important to stress that our patients had multiple additional risk factors and a contraindication for long-term warfarin treatment. Regarding the hemodynamic properties of the LAA and the more detailed information on cardiac deaths: none of these patients died from congestive heart failure.
- We agree that LAA occlusion is not a preventive strategy for all cardioembolic events and that PLAATO at this point cannot be recommended as an alternative to anticoagulation. In the future, once further prospective studies are completed, it may become an alternative for AF patients who are at increased

risk for stroke and who have a contraindication for long-term anticoagulation treatment.

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