

Imaging Support from 3D TEE in Left Atrial Appendage Closures

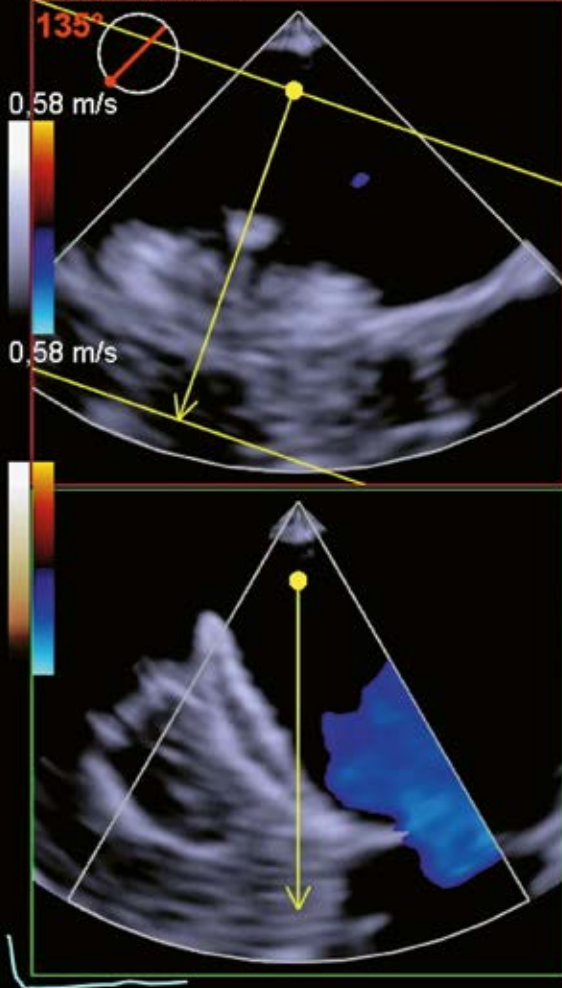
Patients with atrial fibrillation who cannot take long-term anticoagulants have conventionally had few options for lowering their risk of stroke. This was until the recent refinement of left atrial appendage closure (LAAC) procedures. Advances in 2D and 3D intraprocedural imaging and guidance software continue to improve the safety, efficiency, and outcomes of this potentially life-saving intervention.

Text: Peter Jaret

Courtesy: Thomas Schmitz, MD, Elisabeth Hospital Essen, Germany



170410080034984


 0dB / MI: 0,47 / WWI: 0,46
 Kardiologie / TEE* / Z6Ms

Linsentemp: 39,6° C

 10 vps / 60 mm
 53 bpm / Allg. Blutstrom
 -----4D-----
 4.5MHz
 -7 dB
 DB: 69 dB
 ---Farbe---
 CDV / 3.3MHz
 0 dB

1 Real-time 3D TEE with color Doppler shows patency of Amulet™ device.

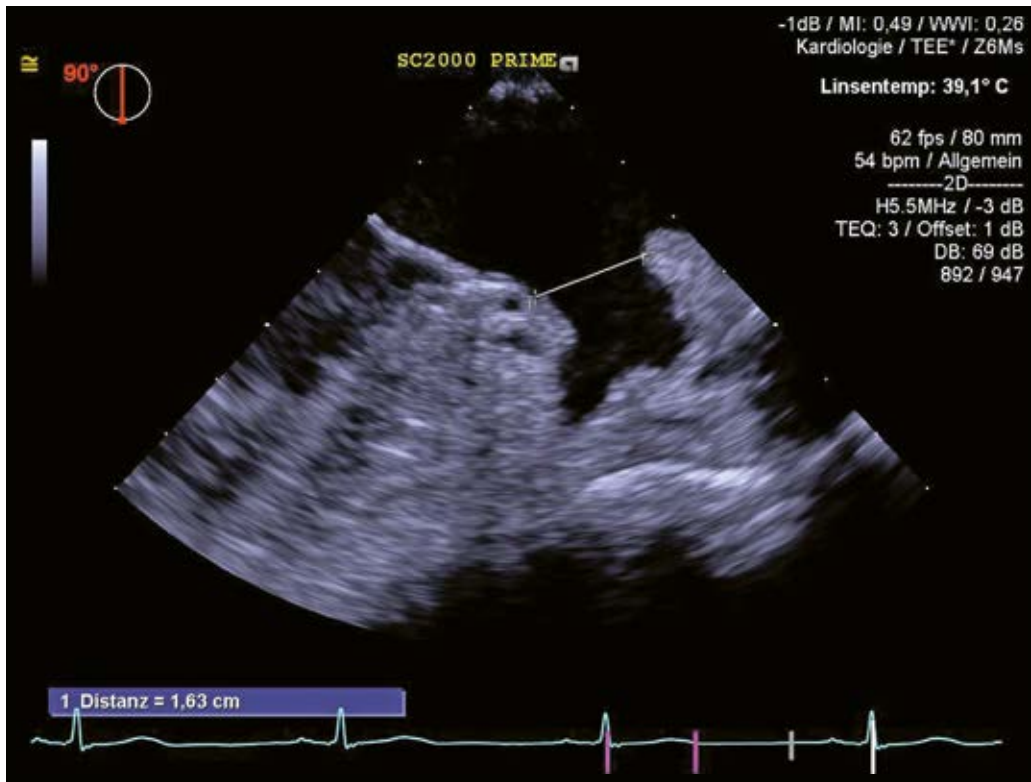
Atrial fibrillation (AF), the most common cardiac arrhythmia, affects an estimated 20 million – mostly older – people worldwide. AF patients are approximately five times more likely to suffer from ischemic stroke compared with people without AF. Almost 90% of the stroke-causing clots in the heart form in the left atrial appendage (LAA). Although many AF patients can lower their risk with oral anticoagulant therapy, such as warfarin or novel oral anticoagulants, medication is contraindicated for many others due to increased bleeding risk. In fact, less than half of AF patients do not receive anticoagulant therapy, either because of contraindications or problems tolerating the drug.

Implanting a device that closes the entrance to the LAA is an attractive alternative for these patients. A case study from Elisabeth Hospital Essen in Germany demonstrates the key role that advanced imaging technologies and guidance software play in the proper implantation of these devices.

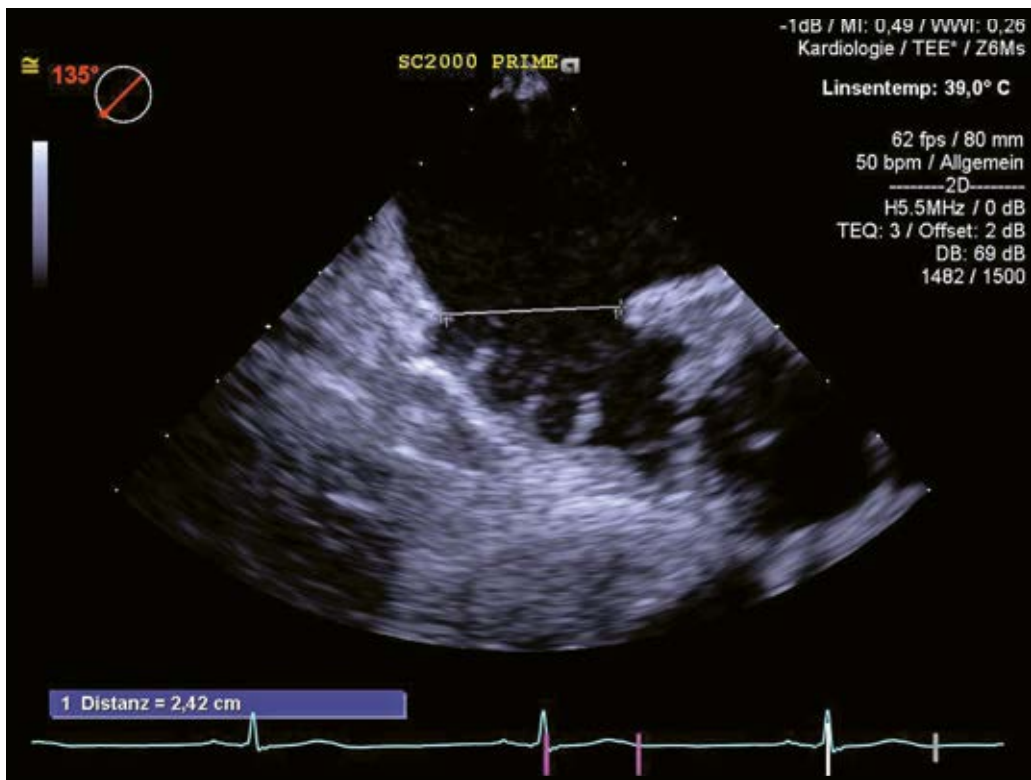
A case study from Elisabeth Hospital Essen

Patient history: A 66-year-old female with AF was referred for left atrial appendage closure. Since the patient had a cerebral cavernous malformation, she could not receive anticoagulant therapy, making her a candidate for LAA closure.

2

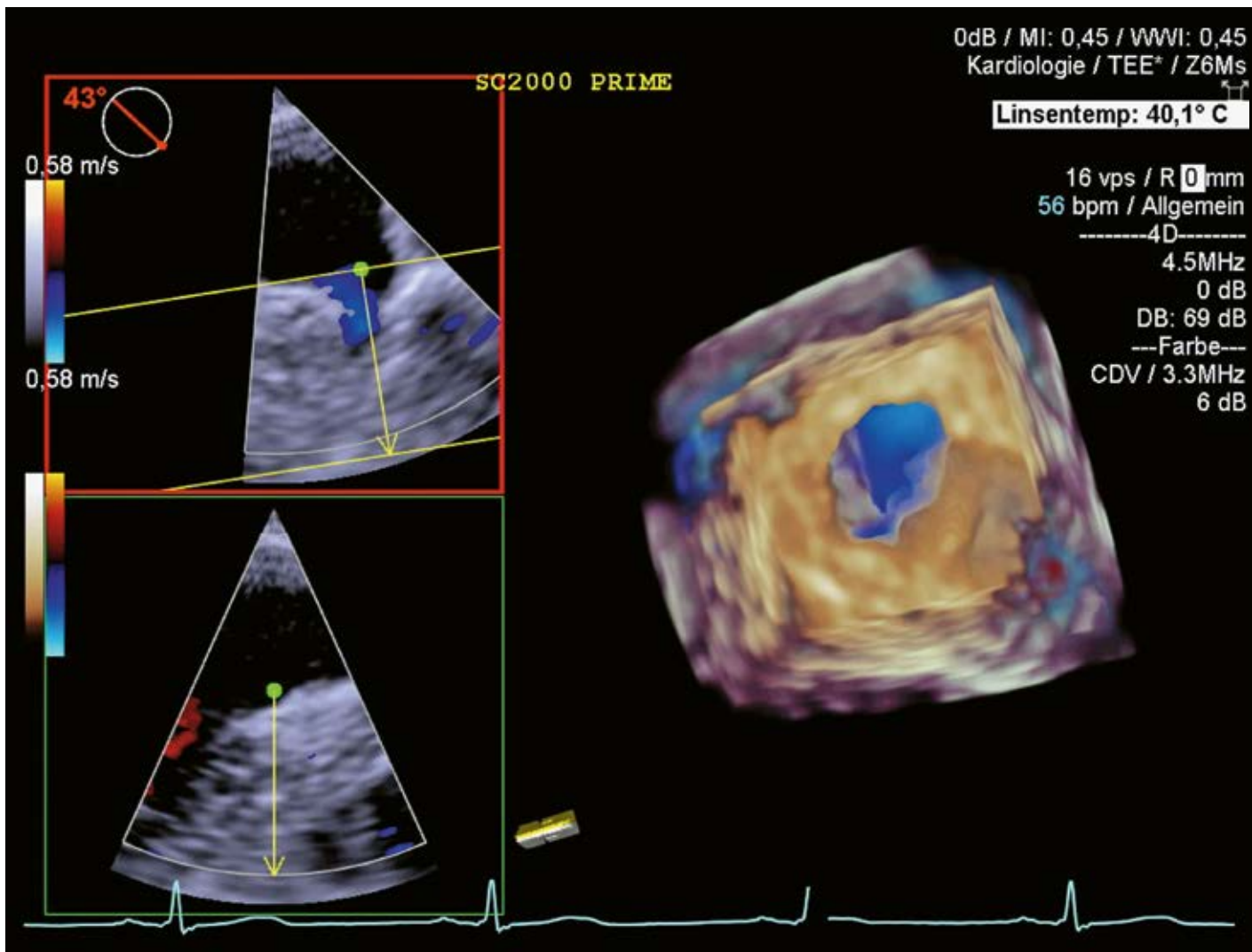


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2 3

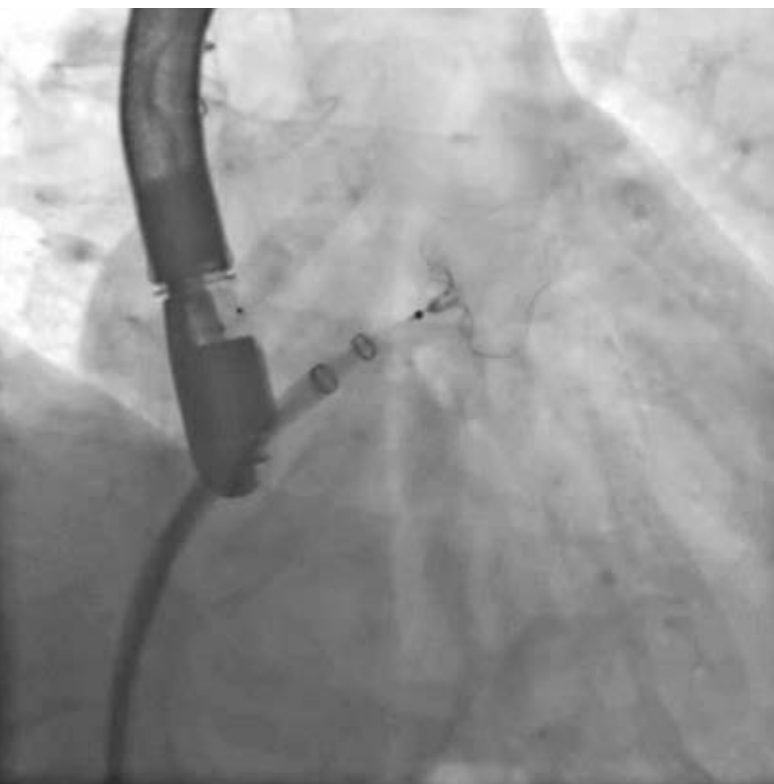
Baseline assessment
with 2D TEE reveals a
“broccoli”-type LAA.



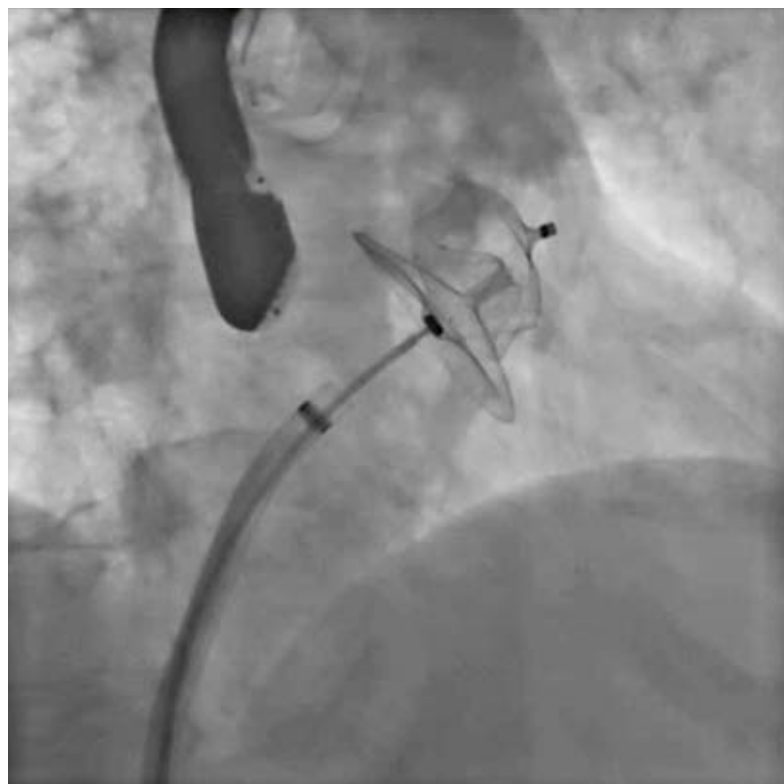
4 Real-time 3D TEE with color Doppler to accurately evaluate flow in the LAA.

Diagnosis and evaluation: The anatomy of the left atrial appendage is unique to each patient. It can take a wide variety of shapes and sizes, which have descriptive names such as “wind sock,” “broccoli,” “cactus,” and “chicken wing.” Hence, the first step was to determine the type and size of the LAA. In this case, 2D transesophageal echocardiography (TEE) was used to assess the morphology of the LAA, revealing that the patient had a “broccoli”-type LAA (Fig. 2-3). This type of LAA can be difficult to close because the entrance is wide but shallow, making placement of a closure device a challenge. The next step was to perform a baseline assessment of the flow in the LAA. A thrombus formation was excluded and flow was analyzed using real-time color Doppler echocardiography (Fig. 4).

Treatment: Initially, a 27-mm WATCHMAN™ device was selected. After successful transseptal puncture, the device was advanced under fluoroscopic control from the right to the left atrium. The device was then positioned in the LAA by using the WATCHMAN sheath. 3D TEE imaging showed residual flow and indicated that the device could not be securely anchored. It also became clear that the selected device was too small to occlude the entrance, so it was removed and replaced with a 30-mm device. Even with this larger size, a test for patency using 2D TEE and angiography indicated residual flow, with an opening in excess of more than 4 mm (Fig. 5). At this point, it was decided that the WATCHMAN was not the appropriate closure device for this kind of anatomy. The procedure was aborted, the device removed, and a second procedure scheduled.



5 Fluoroscopy shows the WATCHMAN device has not successfully sealed the LAA.



6 Tug test using fluoroscopy shows the Amulet device is successfully anchored in the LAA.

For the second procedure, the team selected a 31-mm Amulet device. The lobe and disc design of this closure device requires less depth to sit properly. Using 2D TEE with fluoroscopy guidance, the cardiologist advanced the device through the transseptal puncture into the left atrium and positioned it at the orifice of the LAA. A tug test was performed under fluoroscopy guidance (Fig. 6). The device was tested for patency using contrast injection, which indicated no remaining connection between the LAA and the left atrium. Real-time 3D TEE with color Doppler confirmed that there was no residual blood flow (Fig. 1). The device was completely released. A final check indicated no pericardial effusion and no interference with the mitral valve apparatus.

Comments: LAAC is a proven option for patients with AF who cannot take anticoagulants. Due to the availability of several closure devices, including the WATCHMAN and Amulet, and to advances in 2D TEE, 3D TEE, and guidance software, this procedure is now routine in many cath labs. Indeed, the 2012 European Society of Cardiology Guidelines for the management of AF recommend interventional percutaneous LAAC in patients with a high risk of stroke and contraindications for long-term use of oral anticoagulants. In February 2016, the U.S. Centers for Medicare and Medicaid Services approved LAAC for patients with AF and for those who are unable to take long-term oral anticoagulant therapy.[1] Evidence shows that LAAC achieves a comparable reduction in stroke risk and a statistically superior reduction in cardiovascular death compared to warfarin, one of the most commonly prescribed anticoagulants.



Finding the perfect fit

"LAA closure has rapidly become the standard treatment for AF patients who cannot take anticoagulant therapy long-term," says Thomas Schmitz, MD, head of the cardiac catheter laboratory at Elisabeth Hospital Essen. "Its success has depended not only on the development of effective closure devices, but also on advanced imaging technologies required for proper placement, in particular 3D TEE combined with angiography."

LAAC can still, however, be challenging, as this case study demonstrates. With such a wide variety of LAA shapes, precise preprocedural evaluation of the anatomy is key to choosing the best device and size. 2D TEE with biplane images from four angles can be used for assessment. In retrospect, preprocedural 3D imaging with real-time 3D TEE or cardiac CT may have been useful in this case for appropriate selection of device and sizing. Accurately measuring blood flow using real-time Doppler is crucial to achieving adequate occlusion.

"Real-time 3D color Doppler TEE can be especially useful at the end of the procedure to evaluate how the device sits in place, and to check whether the entrance of the LAA is completely occluded," says Schmitz.

Real-time True Volume 3D TEE can offer added accuracy and confidence for sizing and planning, as well as guidance during device placement. It is therefore likely to become a routine feature of LAAC therapy. ●

Peter Jaret is a frequent contributor to the *New York Times* and other publications. He is the author of several books, including *Nurse: A World of Care* (Emory Press) and *Impact: From the Frontlines of Global Health* (National Geographic).

"In the past, we performed our LAA closure procedures with fluoroscopy and 2D TEE. Today, we find that real-time 3D TEE with color Doppler makes device sizing and implantation easier, which results in more effective LAAC therapy."

Thomas Schmitz, MD
Head of the cardiac catheter laboratory,
Elisabeth Hospital Essen

References

[1] <https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=281> (date accessed 07/26/2017)

The statements by Siemens' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption) there can be no guarantee that other customers will achieve the same results.

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