

EDITORIAL COMMENT

Measure Twice, Close Once

Effect of Volume Loading on Left Atrial Appendage Closure*



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In this issue of *JACC: Cardiovascular Interventions*, Spencer et al. (1) from the Vancouver General Hospital group discuss an important topic in left atrial appendage (LAA) closure. Sizing, as in transcatheter aortic valve replacement (TAVR) and other structural heart interventions, is of the utmost importance in LAA closure. This is one of the first papers asking us to figure out whether what we are measuring is correct.

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In TAVR, much has been made of the noncircular nature of the aortic annulus as well as changes during systole and diastole. The same has not (yet) been mandated for left atrial appendage measurements; the measurement of the ostium is often the largest measurement on transesophageal echocardiography in 4 views (usually 0°, 45°, 90°, and 135°). This is very important because the left atrial appendage is a very variable structure, with 1 or multiple lobes that arise at various angles. The appendage ostium diameter and length help to define device selection as well as device size.

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This paper brings up an important point: what if that diameter is incorrect? Patients are fasting before their procedure, often decreasing intravascular volume. The left atrial appendage responds to volume loading, which can lead a 10% size increase in the left atrial appendage. As the group illustrates, this can lead to 1 size difference for the Watchman device (Boston Scientific Inc., Marlborough, Massachusetts). Unlike the TAVR annulus, which is often covered with calcium, the left atrial appendage ostium is dependent on the fluid status.

This could be the reason why small leaks occur. One can see how a device could be implanted with perfect procedural success. However, measurements were made under fasting conditions; when the patient is back at home and well hydrated, then the appendage is at its full size and the device membrane may no longer have contact with the wall. In addition, this could help to explain the findings by Meincke et al. (2), who instead of the 8% to 20% oversizing did a 15% to 30% oversizing at implantation and found less leakage and device repositioning; perhaps the results can be explained by underexpansion of the LAA. Although not published, the same could also be considered for the Amplatzer Cardiac Plug and Amulet devices (St. Jude Medical, St. Paul, Minnesota) as well as epicardial closure devices.

It is interesting to wonder what happens to the depth of the left atrial appendage with volume loading. As the ostium “grows,” the trabeculated distal tissue may expand a bit as well. This raises certain questions because certain devices (Watchman) require significant depth of appendage for a satisfactory and safe implantation. Even if the depth of the appendage grows by 10%, this still is often not enough to allow a Watchman in the cases in which the depth is a concern.

Giving intravenous fluids during a case may spark some issues. Patients with low ejection fraction may

not handle the fluid easily, with a risk of pulmonary edema (the investigators decreased the bolus to 500 ml in these cases and did not have any of these effects). The investigators gave the fluids during traditional procedural steps, but it is an additional task that one must remember. The “cutoff” of 12 mm Hg is arbitrary; there is no description of what to do if the pressure remains <12 mm Hg after volume administration (not sure if this happened but the number is small in this study). However, these challenges are surmountable; the patient can have fluids given before procedure. In addition, the fluids may also make it easier to perform a safe transseptal puncture.

The investigators describe the lack of a comparator group as a limitation of this study, as this would really show the benefit of volume loading on device selection as well as the prevalence of a peridevice leak. However, we do not need a comparator group to be

convinced of the need for this step. At the Cardiovascular Center Frankfurt, our practice is to check left atrial pressure immediately after transseptal puncture; fluids are given if the pressure is <10 mm Hg. This is one of the key points mentioned during the CSI LAA courses and live cases over the past few years. The work by Spencer *et al.* (1) adds more data to support the practice of volume loading.

Judicious intravenous fluid loading should be part of the procedural steps for left atrial appendage closure. We can say here that the patient who is NPO (nil per os) is at risk of NPOM (not precise ostial measurements).

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