

Mechanical occlusion of the left atrial appendage — lessons from surgical experience

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We read with interest the Review by Caliskan *et al.* on left atrial appendage (LAA) occlusion (Caliskan, E. *et al.* *Interventional and surgical occlusion of the left atrial appendage. Nat. Rev. Cardiol.* **14**, 727–743; 2017)¹. We appreciate that a broad review of this clinical problem is important; however, a critical, and not merely comprehensive, review is needed to fully appreciate the problem of LAA occlusion — namely, the failure of any single technique to reliably and completely occlude the LAA. Caliskan and colleagues' review of technologies would have been better informed by a discussion of the underlying reasons for the failure of these techniques.

LAA anatomy and function are complex. To achieve the ultimate goal of stroke prevention, occlusion must completely smooth the left atrial endocardial surface. One anatomical consideration is the proximity of the circumflex artery to the LAA base. With all occlusion approaches, avoidance of coronary injury might preclude complete occlusion. Furthermore, external devices must navigate the anatomical relationship of the external base to the internal orientation of the appendage ostium, which might also prohibit complete coaptation, leaving a persistent stump. With increasing stand-alone maze procedure volumes, the majority being off-pump², externally applied devices will remain an important technique. From the extensive discussion in their Review on the AtriClip study³ conducted by Caliskan and colleagues, one might understand that confidence in this device is assured. We would caution against reaching this

conclusion before knowing the limitations of that study. First, the definition of 'success' in this study allowed for a residual stump of up to 10 mm. Although this definition is used in other studies^{4–6}, it is arbitrary, and indeed we have reported a case of LAA thrombus in a residual stump of <10 mm despite fully therapeutic anticoagulation⁷. Second, the only transoesophageal echocardiography (TEE) assessment in the AtriClip study was intraoperative; mid-term assessment was performed in only 7.9% of the cohort with the use of CT imaging. Finally, relative stroke risk reduction was based on the CHA₂DS₂-VASc score, not a control group. Although the CHA₂DS₂-VASc score has a C-statistic of 0.8–0.9, this score is not a perfect predictor⁸.

Another surgical approach is from within the LAA, allowing direct visualization and manipulation of the endocardial surface. Theoretically, this strategy should offer a greater chance of success. The challenge lies in the morphological LAA changes that occur when transitioning from an arrested, empty heart to the full, contracting state. Caliskan *et al.* cite several, old, retrospective studies utilizing internal ligation, but neglect contemporary papers. In our prospective, randomized study of three primary surgical techniques⁵, we found that no single technique was superior. The important lesson was that types of failure varied by technique. In the case of internal ligation, residual gaps and internal flow communications developed, probably owing to tension on the internal suture over time⁹. The contribution of atrial size and contractility is not yet known.

These data support the need for definitive LAA assessment before making decisions on anticoagulation cessation. This decision-making requires dedicated imaging. In our practice, we have found challenges in obtaining postoperative TEE, as guidelines do not address the substantial failure rates of LAA closure. Similar to the related clinical problem of atrial fibrillation, assessment of LAA occlusion should consist of more than a single intraoperative evaluation. Continued work on surgical techniques⁷, with an eye towards long-term success, is important, but so is an honest evaluation of the limitations of current techniques and definitions of success.

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doi:10.1038/nrcardio.2018.7
Published online 13 Feb 2018

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Competing interests

The authors declare no competing interests.