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Editorial

Computed Tomography for Assessment of Left Atrial Appendage Function

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▸ See the article "Benefit of Four-Dimensional Computed Tomography Derived Ejection Fraction of the Left Atrial Appendage to Predict Thromboembolic Risk in the Patients with Valvular Heart Disease" in volume 49 on page 173.

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Already 1 century ago, left atrial appendage (LAA) was identified as the location for thrombus formation in patients with atrial fibrillation (AF).[1] Structural changes in LAA, decrease in LAA contractility, and increased pressure in LA appear to be the 3 key factors that predispose to thrombus formation. During normal sinus rhythm, the adequate contraction of the LAA and appropriate blood flow within the LAA reduce the risk of thrombus formation; by contrast, AF causes LAA remodeling and reduces LAA contraction.[2] It is of note that LAA thrombus does not occur exclusively in AF, but also in many other cardiac conditions including heart failure and valve disease, which increases the intracardiac filling pressure.

As for non-invasive imaging of LAA for the risk assessment, transesophageal echocardiography (TEE) is considered the gold standard and is the most widely used and accepted modality. It has a negative predictive value of nearly 100% for detection of LAA thrombi when compared with intraoperative findings.[3] Nonetheless, because LAA cannot be always visualized completely because of the multilobed structure, LAA velocity using Doppler echocardiography is used as a complementary measurement. LAA velocity correlates with LAA contraction and an estimate for LAA ejection fraction (EF). Velocities <40 cm/s are associated with a higher risk of stroke and the presence of spontaneous echo contrast (SEC).

With advancement in the image acquiring technologies and computational capacities, multi-detector computed tomography (MDCT) is one of the emerging modalities for the LAA assessment. Compared to TEE, MDCT has comparable spatial resolution and can identify LAA thrombi with a sensitivity of 100%; however, the positive predictive value, ranging between 41–91%, is an important limitation. Further limitations include that LAA mechanical function could not be easily evaluated, until retrospective gating was available.

With introduction of 4-dimensional computed tomography (4DCT), which includes the time factor, not only the assessment of cardiac anatomy but also the function became possible. In contrast to TEE, 4DCT does not measure in 'real time', but requires reconstruction of images acquired with retrospective gating. In the study by Kim et al.[4] published in this journal, the authors examined the role of 4DCT for prediction of thrombus formation in 62 patients with valvular heart disease and sinus rhythm who had undergone surgery. Because they

included only patients with valve disease that required surgical management, it is very likely that those patients had also hemodynamic alterations, i.e. increased intracardiac pressure, which may explain that an astonishing 45% of the enrolled patients had SEC or thrombus. AF patients with SEC have an annual stroke rate of 18.2%, and presence of thrombus triples the risk.[5] Even without AF, patients with valve disease are at increased risk and need proper risk stratification to develop treatment strategies. The authors measured computed tomography (CT) LAA EF and showed significant correlation with TEE velocity. They also provided a best cut off value of LAA EF of <37.5% to predict SEC or thrombus.

Because many patients routinely undergo CT scan before valve surgery, LAA EF measured with 4DCT may be an attractive option for the risk assessment of cardiac emboli, which was proposed by the authors in this study. However, many important questions remain unanswered. First, SEC itself is a risk factor for thrombus formation, so that it may not be the ideal endpoint. Second, because the patients were scheduled to undergo valve surgery, it would be interesting to know whether CT LAA EF would change after surgery along with its predictive value. Third, because of the lack of longitudinal follow-up data, it is unknown whether CT LAA EF can predict future risk in both patients with and without valve surgery. As clinical implication, it would be interesting to know whether the patients with severe valve disease, sinus rhythm and LAA EF <37% would benefit from antithrombotic therapy.[6] If yes, which one: anticoagulation versus antiplatelet therapy. All these questions should be addressed in future studies to give descent practice guidelines in these high-risk patients.

REFERENCES

1. Blackshear JL, Odell JA. Appendage obliteration to reduce stroke in cardiac surgical patients with atrial fibrillation. *Ann Thorac Surg* 1996;61:755-9.
PUBMED | CROSSREF
2. Beigel R, Wunderlich NC, Ho SY, Arsanjani R, Siegel RJ. The left atrial appendage: anatomy, function, and noninvasive evaluation. *JACC Cardiovasc Imaging* 2014;7:1251-65.
PUBMED | CROSSREF
3. Manning WJ, Weintraub RM, Waksmonski CA, et al. Accuracy of transesophageal echocardiography for identifying left atrial thrombi. A prospective, intraoperative study. *Ann Intern Med* 1995;123:817-22.
PUBMED | CROSSREF
4. Kim IC, Chang HJ, Cho IJ, et al. Benefit of four-dimensional computed tomography derived ejection fraction of the left atrial appendage to predict thromboembolic risk in the patients with valvular heart disease. *Korean Circ J* 2019;48:173-80.
CROSSREF
5. Transesophageal echocardiographic correlates of thromboembolism in high-risk patients with nonvalvular atrial fibrillation. The stroke prevention in atrial fibrillation investigators committee on echocardiography. *Ann Intern Med* 1998;128:639-47.
PUBMED | CROSSREF
6. Joung B. Real-world data and recommended dosage of non-vitamin K oral anticoagulants for Korean patients. *Korean Circ J* 2017;47:833-41.
PUBMED | CROSSREF

https://doi.org/10.4070/kcj.2018.0355