Left Atrial Appendage Blood Velocity and Thromboembolic Risk in Patients With Atrial Fibrillation

We note with interest the study by Mügge et al. (1), which appeared in the same issue of the Journal as our own study (2), which examined left atrial appendage function and thromboembolism in patients with atrial fibrillation. Although there were many points of agreement between the studies, particularly with regard to the relation between low left atrial appendage blood velocity and the risk of spontaneous echo contrast and thrombus formation, somewhat differing conclusions were reached with regard to the relation between left atrial appendage blood velocity and previous embolic events. Mügge et al. found that 6 (60%) of 10 patients with nonvalvular atrial fibrillation and a "low flow profile" (<25 cm/s) left atrial appendage Doppler blood flow pattern had a history of systemic embolic events (ischemic stroke or peripheral embolism), whereas only 1 (5%) of 19 patients with a "high flow profile" (>25 cm/s) velocity pattern had a history of such events (p < 0.05). It was concluded from these results that patients with low left atrial appendage blood velocity may be at increased risk for thromboembolic complications. However, it is notable that the mean left atrial appendage blood velocity in the additional group of 12 patients with chronic atrial fibrillation and mitral stenosis studied by Mügge et al. was considerably lower than that of the patients with nonvalvular atrial fibrillation and a low flow profile; yet only two of the former patients (17%) had a history of embolic events. Sixteen (53%) of the 30 control patients in sinus rhythm with a high left atrial appendage velocity also had a history of embolic events.

In contrast, in our recent study (2) in a heterogeneous group of 140 patients with nonvalvular and valvular atrial fibrillation, no clear relation was demonstrated between a history of systemic embolic events (ischemic stroke, transient cerebral ischemic attacks or peripheral embolism) and any of the five left atrial appendage blood velocity patterns observed. To determine whether differences in patient groups, definition of outcome events or classification of left atrial appendage blood velocity patterns contributed to the different results of these studies, we have reanalyzed our data according to the methods described by Mügge et al. From the 140 patients, a subgroup of 85 patients with nonvalvular atrial fibrillation, all of whom were in atrial fibrillation at the time of study, were identified (chronic atrial fibrillation in 54 patients, paroxysmal atrial fibrillation in 29, first episode atrial fibrillation in 7). No statistically significant differences were found in the prevalence of previous stroke or peripheral embolism between those patients with left atrial appendage blood velocity <25 cm/s and those with velocity >25 cm/s (13 [30%] of 44 vs. 7 [17%] of 41). Moreover, the mean velocity in the 20 patients with embolic events (24 ± 13 cm/s, range 8 to 59) was not significantly different from that in the 65 patients without events (29 ± 15 cm/s, range 7 to 69).

Verhorst et al. (3) have also examined left atrial appendage blood velocity and embolic events in 54 patients with nonvalvular atrial fibrillation, 23 (43%) of whom had paroxysmal atrial fibrillation and were in sinus rhythm at the time of study. In that study, statistically significant differences were found in the mean left atrial appendage velocity between 10 patients with a history of ischemic stroke (25 ± 19 cm/s) and 38 patients without stroke (39 ± 23 cm/s, p < 0.05). When we reanalyzed our data to include 24 patients with paroxysmal atrial fibrillation studied in sinus rhythm, we found that the mean left atrial appendage velocity in 26 patients with embolic events (32 ± 23 cm/s) was not significantly different from that in 83 patients without events (36 ± 21 cm/s).

The inability to demonstrate a velocity-dependent increase in embolic events in a larger patient cohort, using the same methods as those used by other investigators, raises the possibility that the results reported by Mügge et al. (1) and Verhorst et al. (3) may reflect chance findings in relatively small patient groups. It may also reflect the many confounding variables in retrospective analyses of this nature. It is difficult to control for treatment effects, for example. Whereas anticoagulant therapy may have prevented strokes in some patients, others may have commenced receiving anticoagulant therapy after an embolic event. In addition, although ischemic strokes in patients with atrial fibrillation are presumed cardioembolic in origin, it is possible that carotid or cerebral atherosclerosis may be the primary mechanism responsible in a considerable proportion of cases. Finally, although our study and that of Mügge et al. are in agreement that low left atrial appendage blood velocity promotes spontaneous echo contrast and thrombus formation, it is possible that intermediate or higher blood velocities or variable hemodynamic conditions may favor embolization (2).

The relation between left atrial appendage blood velocity, spontaneous echo contrast and thrombus formation is important because the finding of low velocities in patients with atrial fibrillation may influence the decision to commence anticoagulant therapy. However, proof of the therapeutic efficacy of such treatment stratification would require controlled, randomized, prospective evaluation. Given the existing data on anticoagulant therapy in patients with atrial fibrillation (4-7), it is unlikely, on ethical grounds, that such studies will be conducted.

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References


Reply

In our article (1), we compared the left atrial appendage blood velocities among patients in sinus rhythm, atrial fibrillation due to severe mitral stenosis and nonrheumatic atrial fibrillation. Our conclusions were that the left atrial appendage blood velocity appears to be heterogenous in patients with nonrheumatic atrial fibrillation, and we identified two subgroups, one with a "high flow profile" and the other with a "low flow profile." Because the latter closely resembles that seen in patients with severe mitral stenosis, we concluded that a low flow profile of left atrial appendage blood velocity may be helpful to identify a subgroup of patients with nonrheumatic atrial fibrillation at increased risk for thrombus formation and subsequent cardiogenic embolism. This conclusion was supported by the observation that a spontaneous echo contrast phenomenon as an (indirect) indicator for thrombus formation was more frequently found (80%) in patients with a low flow profile than in those with a high flow profile (5%); furthermore, three thrombi confined to the left atrial appendage were noted, all three of the patients were in the low flow group. The argument of Fatkin et al. that this risk strategy does not hold true because the actual incidence of (clinical evident) embolism did not correspond with the left atrial appendage function is based on a misleading interpretation of our data. Most patients with rheumatic atrial fibrillation in our study were treated with anticoagulant agents. Thus, we were not able to demonstrate that there is an increased incidence of thrombus formation and embolism in these patients; however, I think that this might be superfluous because it is well known. Furthermore, the argument that there was a high incidence of "embolic events" in patients in sinus rhythm is not correct. In fact, patients ... sinus rhythm underwent transesophageal echocardiography for various reasons. The main indication was indeed ischemic stroke; however, this indication for echocardiographic examination does not imply at all that cardiogenic embolism had readily occurred. These arguments reflect the principal difficulties in analyzing the association between echocardiographic variables and clinical events because too many, uncontrolled variables may be involved, as mentioned by Fatkin et al. For this reason, we preferred in our study to compare echocardiographic variables between different groups of patients who were known for their embolic risk rather than to correlate quantitative variables with actual (not well defined) clinical events.

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