RESEARCH LETTER

Rationale for cerebral protection in patients with left atrial appendage thrombus during percutaneous left atrial appendage closure: a single-center initial experience

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Introduction Percutaneous left atrial appendage closure (LAAC) is an option for stroke prevention in patients with atrial fibrillation who are not good candidates for long-term oral anticoagulation or those in whom antithrombotic treatment is contraindicated. Excluding the presence of a thrombus in the left atrium is a mandatory step of this procedure, since stroke is one of the most severe complications during LAAC. Periprocedural stroke may also be potentially avoided by taking advantage of cerebral protection systems (CPSs). The main purpose of using CPSs is to apply a mechanical measure to reduce the risk of stroke associated with intraprocedural transcatheter aortic implantation, but the use of CPSs may increase the safety of LAAC procedures and makes it potentially suitable for patients with a clot within the left atrium. Here, we report a series of LAAC procedures using Sentinel CPSs in patients with a thrombus in the left atrial appendage (LAA). The course of procedures, factors determining the efficacy of neuroprotection, and short-term follow-up outcomes were also analyzed.

Patients and methods The Sentinel CPS (Boston Scientific, Marlborough, Massachusetts, United States) was used during LAAC procedures in 6 consecutive patients at a mean (SD) age of 72.5 (7.5) years, CHA_2DS_2VASc of 4.33 (1.37), and HAS-BLED score of 2.83 (0.69), in whom oral anticoagulation was contraindicated and an LAA clot diagnosed on preprocedural transesophageal echocardiography (TEE). The procedures were performed in patients with both proximal and distal thrombi (examples are presented in Supplementary material, *Figure S1*). In 3 cases, an attempt was made to dissolve the thrombus with the use of anticoagulants or low-molecular-weight heparin. In the remaining patients, such an attempt was not made owing to absolute contraindications to this therapy. Initially, aortography was performed via the radial approach to visualize the aortic arch and the anatomy of the carotid arteries. The aortic arch type was determined based on the brachiocephalic trunk diameter and the distance between it and the top of the aortic arch. For type I aortic arch, that distance was shorter than 1 width of the brachiocephalic trunk. If the distance ranged between 1 and 2 diameters of the brachiocephalic trunk, it indicated a type II aortic arch, and if the distance was greater than 2 diameters of the brachiocephalic trunk, the aortic arch was denoted as type III.[1]

In the next step, the Sentinel CPS was introduced. Its proximal filter was deployed in the brachiocephalic trunk, whereupon the distal filter was opened in the left common carotid artery. Angiography of the LAA was abandoned to reduce the risk of thrombus release. All procedures were conducted using the Amplatzer Amulet occluder (St. Jude Medical, Minneapolis, Minnesota, United States), which does not require deep catheter placement in the LAA. The Sentinel CPS filters were removed directly after Amplatzer Amulet occluder implantation, flushed with saline, and visually evaluated for the presence of embolic material. After the procedure, the patients remained on dual antiplatelet therapy for 6 weeks. During the follow-up examination, the patients were evaluated for neurological deficiencies; additionally, TEE was repeated.

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TABLE 1 Characteristics of percutaneous left atrial appendage closure procedures using the Sentinel Cerebral Protection System

Characteristic	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6
Proximal LAA thrombus	Yes	No	No	No	No	No
Thrombus area, cm^2	1	0.8	3.6	1.8	1.4	1.9
Debris in the proximal filter of the Sentinel CPS	Yes	No	Yes	No	Yes	Yes
Debris in the distal filter of the Sentinel CPS	Yes	No	Yes	No	NA	Yes
Periprocedural stroke	No	No	No	No	No	No
Peripheral thromboembolism	No	No	No	No	No	No
Fluoroscopy time, min	10	12	10	12	22	18
Contrast medium, ml	40	40	40	100	60	50
Procedure time, min	90	90	60	115	70	105

Abbreviations: CPS, Cerebral Protection System; LAA, left atrial appendage; NA, not applicable

Results It was possible to use the Sentinel CPS in all patients, without prior evaluation of the carotid arteries by computed tomography. The aortic arch anatomy was assessed and classified as one of the 3 types based on intraprocedural aortography. In our series of cases, a type I aortic arch was present in 3 patients, type II in 2 patients, and type III in a single patient. We managed to protect the brachiocephalic trunk with the Sentinel CPS in all patients, but only in 5 of the 6 patients we could deploy the distal cup of the Sentinel CPS in the left common carotid artery. Unsuccessful deployment of the distal cup occurred in a patient with a type III aortic arch.

Lack of previous experience in Sentinel CPS use did not extend the mean (SD) LAAC procedure time (86.67 [19.08]) min compared with our earlier results obtained for LAAC without CPSs. The mean (SD) fluoroscopy time was 14 (4.47) min, and the volume of the contrast medium used was 55 (21.41) ml. No vascular complications at the access site were noted. Small debris was present in the proximal or distal filter of the Sentinel CPS in 4 patients. Detailed procedural characteristics are presented in TABLE 1. The neurological assessment performed prior to hospital discharge did not reveal any new deficits.

During the 6-week follow-up, none of the patients sustained ischemic stroke nor did they develop any new neurological deficits. During follow-up, successful LAAC was confirmed by TEE; no device-related thrombus formation was noted in any patient.

Discussion Stroke onset constitutes one of the most severe complications of LAAC. To date, recommendations for LAAC eligibility evaluation endorse excluding the presence of a thrombus in the LAA before the procedure. In most cases, the presence of a clot in the left atrium in patients with atrial fibrillation results in the initiation or intensification of pharmacological anticoagulation.

Meanwhile, anticoagulant therapy initiation, often followed by modifications in search for a more effective treatment, is associated with an increased risk of bleeding. Additionally, these patients are exposed to repeated TEE. However, data have indicated that if a thrombus is found in the LAA, then, frequently, none pharmacotherapy is effective. Recently published data based on a population of 1485 patients with atrial fibrillation have shown that thrombus resolution occurred in only 58.7% of the patients who could receive anticoagulant therapy.[2]

Embolic material within the LAA is frequently found in patients in whom anticoagulant therapy is contraindicated and who would potentially benefit from LAAC. Moreover, patients who have a thrombus despite the use of adequate anticoagulation can benefit from LAAC.

Few reports on LAA elimination despite the presence of embolic material have been published, which limits data availability. The most significant trial was based on 28 cases from 8 centers, with 6 procedures performed using different neuroprotection systems (4 with the TriGUARD system, 1 with the Sentinel CSP, and 1 with the Filter Wire EZTM).[3] In most cases (24 out of 26) within that study, a clot was found in the distal part of the LAA. Complete technical and procedural efficacy was achieved. However, in post-treatment therapy, anticoagulation was continued in 53.5% of the patients. During the follow-up period, none of the patients had stroke.[3]

Lee et al[4] published the results of the multicenter registry of LAAC procedures, in which they compared the results of using Amplatzer and Watchman occluders. In 10 patients undergoing the procedure, they found a clot in the LAA, whereas in 132 patients, no thrombi were found. The study showed no significant differences concerning the safety of the procedures and the effectiveness of protection against stroke at long-term follow-up.[4]

Despite the aforementioned data, only a few case reports described a safe elimination of the LAA in the case of detecting a thrombus in the proximal part of the LAA.[5-7] Performing such a procedure requires much experience and precision. The risk of releasing embolic material rises if multiple repositions of the occluder are needed. Therefore, it is reasonable to use systems protecting the central nervous system. However,

the anatomy of the aortic arch may influence the effectiveness of Sentinel CPS use. According to our findings, in patients with a type III aortic arch, the distal cup deployment in the left carotid artery may not be possible. The analysis of computed tomography scans also indicated that even in 2/3 of cases, the dimensions of the brachiocephalic or left common carotid arteries may be incompatible with the diameter of Sentinel CPS filters.[8]

In the present case series, we showed that the use of the Sentinel CPS might be effective in the prevention of periprocedural stroke. Moreover, in most cases, we found debris in the neuroprotection filters. The use of the Sentinel CPS does not significantly prolong the procedural time and does not require much experience. Therefore, our observations suggest that the eligibility criteria for LAAC procedures should be reevaluated and updated.

SUPPLEMENTARY MATERIAL

Supplementary material is available at www.mp.pl/paim.

ARTICLE INFORMATION

CONFLICT OF INTEREST WS, KM, and ZK are proctors of Abbott Medical. Other authors declare no conflict of interest.

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