Pulmonary Artery Perforation by Plug Anchoring System After Percutaneous Closure of Left Appendage

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Percutaneous closure of the left atrial appendage (LAA) is increasingly referred for percutaneous left atrial appendage exclusion. Although effective, this procedure is not free from risk. We report a case of pericardial tamponade due to pulmonary artery tear caused by a trespassing anchoring hook of an AGA plug. Intraoperatively, no actual bleeding was found from the left appendage, a proof of its complete occlusion by the device. The patient underwent successful surgical repair and radio-frequency ablation of atrial fibrillation was performed by pulmonary veins encircling.

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Atrial fibrillation is the most common arrhythmia in clinical practice that bears a fivefold increased risk of stroke and is directly related to 3% to 8% per year rate of cerebrovascular events [1, 2]. Although oral anticoagulant drugs are considered the preferred option in patients with consistent risk of stroke [3], innovative interventional strategies are appearing in the clinical scenario. Because the left atrial appendage (LAA) is the major source of emboli in nonvalvular atrial fibrillation [4], the concept of LAA exclusion has been developed for the prevention of cerebral embolism. The feasibility and efficacy of percutaneous transcatheter LAA occlusion have been proved, and LAA occlusion is noninferior to oral anticoagulant drugs in the prevention of stroke, cardiovascular death, or systemic embolism [5–7]. Although patients at high bleeding risk could be considered for this nonconventional treatment [1], this procedure is not without risks, cardiac tamponade being reported as the most frequent [4]. We report a case of main pulmonary artery perforation by the stabilizing hooks of an AGA plug (AGA Medical Corp, Minneapolis, MN) that required surgical intervention for cardiac tamponade.

A 76-year-old man with highly vascularized cerebral angioma and persistent atrial fibrillation was scheduled for percutaneous LAA closure owing to high risk of intracranial hemorrhage related to chronic oral anticoagulant drug therapy (CHAD2VASC2 [acronym for congestive heart failure, hypertension; age 75 years or more, diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism; vascular disease; age 65 to 74 years; sex category] score = 3). The procedure was carried out as follows: under general anesthesia, a Mullins catheter was advanced toward the right atrium, and the transeptal puncture was performed with a Brockenbrough catheter under the guidance of intracardiac echocardiography (AcuNav 8F; Siemens, Mountain View, CA). Several angiographic views were obtained to determine the optimal plug size (Fig 1). A 22-mm AGA plug was deployed in the LAA, as already described [5]. Selective left atrial angiography showed complete occlusion of the left appendage (Fig 2).

The procedure was uneventful. The patient fully recovered from anesthesia and was transferred to the ward. After 3 hours, the patient experienced a profound bradycardia with severe hemodynamic compromise. Echocardiography showed a massive pericardial effusion with cardiac tamponade, requiring fluid resuscitation and inotropic support. In the catheterization laboratory, a subxyphoid pigtail catheter was introduced, and 1,400 mL blood drained, with improvement of the hemodynamics. While the left atrial angiography showed a complete LAA occlusion, right ventricular angiography showed contrast medium leakage into the pericardial cavity. The patient was immediately transferred to the operating room for surgical exploration.

Under general anesthesia, a median sternotomy was performed. The pericardium was opened and blood clots removed. Left atrial appendage and pulmonary artery and veins were carefully inspected; a stabilizing hook of the plug completely trespassing the appendage wall without active bleeding was found. A pulsating venous bleeding was also noted on the lateral wall of the pulmonary main trunk. The 2-mm tear was secured with a pledgeted 4–0 polypropylene “U” suture. No active bleeding was present through the appendage, and the pledgeted suture prevented further scratch of the pulmonary artery by the plug’s stabilizing hook; therefore, we decided to leave it in place (Fig 3). Because the patient had a history of persistent atrial fibrillation and direct access to the heart was already obtained, beating-heart pulmonary veins isolation with bipolar radiofrequency forceps (Isolator Synergy AtriCure) was accomplished. The operation was then completed in routine fashion, and the patient was transferred to the intensive care unit.

The postoperative recovery was uneventful, and the patient returned to the ward on the first postoperative day. An episode of atrial fibrillation on the fourth postoperative day was efficaciously treated with an intravenous bolus of amiodarone. The patient underwent a predischarge angiography computed tomography scan that outlined the correct positioning of the AGA plug and the complete exclusion of the LAA (Fig 4). He was discharged home on the sixth postoperative day. At the outpatient clinic 5 months later, he was in good hemodynamic status, sinus rhythm, on a regimen of beta-blocker (Bisoprolol) and antiplatelet (Clopidogrel) therapy.

Comment

A bleeding event after percutaneous closure of the LAA is not uncommon. In the Embolic Protection in Patients With Atrial Fibrillation (PROTECT-AF) study, 4.8%
periprocedural pericardial hemorrhage requiring intervention is reported. In 2011, Park and colleagues [8] reported a 7% major complication rate, with 4% incidence of cardiac tamponade, in one case due to pulmonary artery puncture with transseptal needle. Percutaneous closure of the atrial appendage is a quick and effective procedure for patients with atrial fibrillation with anticoagulant therapy contraindication and high risk of thromboembolic events (CHAD score ≥2) [5–8]. Despite the striking advantages, the procedure is not free from risks. In a recent series of 132 patients with successful LAA exclusion, 10 patients (7%) had major complications such as ischemic stroke, device embolization, and clinically significant pericardial effusions [8].

In this report, we described an unusual complication due to the device’s stabilizing hook, causing perforation of the left appendage and subsequently scratching and perforation of the main pulmonary artery, resulting in acute pericardial tamponade requiring surgical decompression and closure of the arterial tear. Nevertheless, the AGA plug device was very effective in left appendage exclusion since no intraoperative bleeding was noted from the LAA, and predischarge and follow-up com-

Fig 1. Angiography showing appendage measures (A, B, C) for AGA plug (AGA Medical Corp, Minneapolis, MN) choice.

Fig 2. Angiography after deployment, showing complete exclusion of the left atrial appendage.

Fig 3. Intraoperative view of the left atrial appendage (LAA) and pledgets of repaired pulmonary artery.

Fig 4. Predischarge computed tomography scan showing relationship between the plug, the main pulmonary artery (PA), and pledgets. (Ao = ascending aorta; LA = left atrium.)

Fig 5. Image showing the AGA plug (AGA Medical Corp, Minneapolis, MN) insertion.
Computed tomography scan showed complete exclusion of the left auricle. We strongly believe that, as required by the National Institute for Health and Clinical Excellence guidelines, these procedures should be carried out only in units with on-site cardiac surgery [9]; in the presented case, prompt surgical treatment avoided a bleak outcome for the patient. Furthermore, a close interplay of knowledge and skills between the interventional cardiologist and the cardiac surgeon led to prompt intraoperative assessment and effective treatment of this unusual complication.

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References