

# Late Coronary-cameral Fistula Formation Between Circumflex Coronary Artery and Left Atrial Appendage Following Implantation of an Amulet Closure Device

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## Abstract

An 80-year-old patient presented with a rare complication: a late coronary-cameral fistula following implantation of an Amulet (Abbott) left atrial appendage occlusion device. Microperforations from the device's anchoring tines have previously been suggested as a possible mechanism of fistula formation, a complication reported in two other cases. We propose an alternative theory of potential collateralisation of the threatened appendage from the nearby circumflex artery.

## Keywords

Left atrial appendage occlusion, fistula, circumflex, appendage, Amulet

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**Consent:** The patient gave informed consent and the article has been anonymised to remove any patient-identifiable information.

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AF is associated with a fivefold increase in stroke risk.<sup>1</sup> Reduced appendage contractility and blood stasis can lead to thrombus shedding.<sup>2</sup> Left atrial appendage occlusion (LAAO) is an alternative treatment for stroke prevention in patients who cannot tolerate anticoagulation. Evidence suggests that LAAO is non-inferior to systemic anticoagulation.<sup>3,4</sup> We present a rare case of delayed coronary-cameral fistula formation following implantation of a LAAO device.

## Case Summary

An 80-year-old female with AF suffered a thalamic bleed while taking warfarin. Anticoagulation therapy was discontinued but she then suffered a posterior circulation stroke. She was subsequently referred to our service for LAAO, and a 28 mm Amulet device was implanted in 2015.

Seven years later, the patient presented to her local hospital with a suspected acute coronary syndrome. Her ECG showed lateral T wave inversion and ST depression with mild troponin elevation. Coronary angiography showed a chronically occluded left anterior descending artery and moderate disease in the other vessels. An unexpected finding was contrast filling of the distal left atrial appendage, which was presumed to emanate from the left circumflex coronary artery via possible intramyocardial perforators, suggestive of a coronary-cameral fistula (*Figures 1 and 2 and Supplementary Videos 1 and 2*).

A subsequent CT scan demonstrated close proximity between the circumflex and the appendage, but no clear communication was seen between the two structures on thin-sliced images (*Figure 3*). There were also no features to suggest peri-device leak or thrombus formation. The CT and angiogram images were reviewed in a multi-disciplinary team

meeting and the overall consensus was that there appeared to be a small leash of vessels originating from the proximal circumflex artery which perforated through the myocardium to provide flow to the appendage indicative of a coronary-cameral fistula.

## Discussion

A coronary-cameral fistula is a rare, anomalous connection between a coronary artery and a cardiac chamber.<sup>5</sup> While the majority are congenital, they can also be acquired following cardiac intervention.<sup>5</sup> We present a rare case of a left circumflex artery to left atrial appendage fistula that developed after the implantation of an Amulet (Abbott) left atrial appendage occlusion device. This finding has been rarely reported with the Amulet, LAmBRE (Lifetech Scientific) and Watchman FLX (Boston Scientific) devices.<sup>6–9</sup>

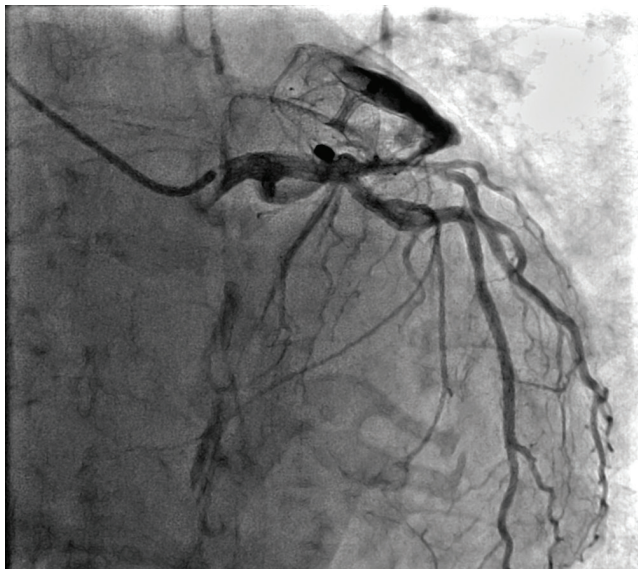
The mechanism of arterial filling of the left atrial appendage remains uncertain. The appendage itself is thin-walled and has a close anatomical relationship with key structures including the left upper pulmonary vein, mitral valve annulus and left circumflex artery.<sup>10</sup> Microperforations caused by device anchors but not leading to pericardial tamponade have been proposed as a possible mechanism through which fistula develop.<sup>6,7</sup> However, in this case, there was no evidence of a clear communication between the two chambers.

It is well-established that coronary ischaemia can result in the formation of collaterals to provide blood to jeopardised, hypoxic myocardium through complex angiogenic mechanisms.<sup>11</sup> We propose a theory that occlusion following device implantation may initiate an ischaemic cascade, with signalling from the threatened appendage stimulating the

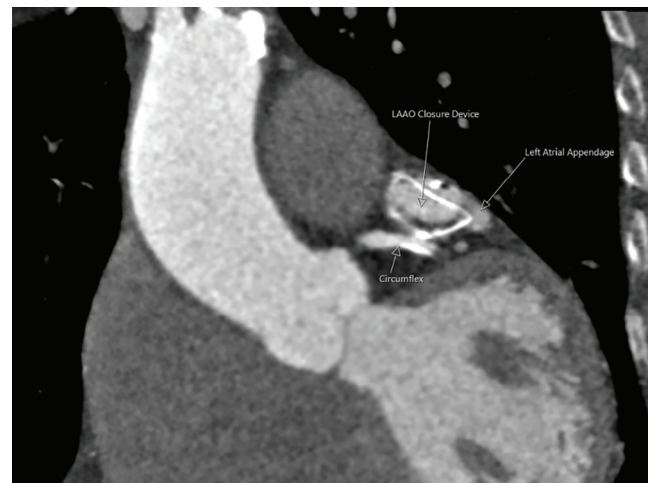
**Figure 1: Posterioranterior View Demonstrating Contrast Opacification of the Left Atrial Appendage Occlusion from the Circumflex Artery**



**Figure 2: Left Anterior Oblique Cranial View Demonstrating Contrast Opacification of the Left Atrial Appendage Occlusion from the Circumflex Artery**



**Figure 3: CT Image Demonstrating the Left Atrial Appendage Occlusion Device**



*CT image demonstrating the left atrial appendage occlusion device in close proximity to the proximal left circumflex artery with contrast opacification of the appendage but no clear connection between the two structures. LAAO: left atrial appendage occlusion.*

development of a 'collateral' circulation to supply blood to this area from the nearby circumflex artery. In alignment with this theory, many patients with a successfully occluded left atrial appendage exhibit contrast enhancement within the appendage itself despite apparent echocardiographic complete closure. This phenomenon is well described but poorly understood.<sup>12</sup>

This case highlights an important and possibly under-recognised complication of LAAO. Further studies are required to understand the exact mechanisms through which it occurs. □

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