



Left Atrium Compression by Iatrogenic Hematoma Due to Left Atrial Appendage Clipping in Open Coronary Artery Bypass Grafting Surgery

CASE REPORT

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ABSTRACT

Left atrial appendage (LAA) clipping during open cardiac surgery is widely used for stroke and embolization prevention in atrial fibrillation. Various devices are available for this purpose, including the AtriCure AtriClip and the recently introduced Medtronic Penditure clip. We present a case of a 59-year-old male with multiple comorbidities, including chronic kidney disease and coronary artery disease, who underwent coronary artery bypass grafting with prophylactic LAA clipping using the Medtronic Penditure atrial clip. The procedure was complicated by an iatrogenic hematoma due to clip erosion into the atrioventricular groove, leading to left atrial tamponade and necessitating chest re-exploration. This case underscores the importance of understanding the structural interactions between different LAA occlusion devices and surrounding cardiac anatomy. Further evaluation is warranted to assess the safety profile of newer LAA occlusion devices and their impact on postoperative outcomes.

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INTRODUCTION

Left atrial appendage (LAA) clipping during open cardiac surgery has been widely adopted by surgeons for the prophylactic prevention of stroke and clot embolization in atrial fibrillation.¹ Since its market introduction, the AtriClip device (AtriCure) has been considered safe and integral to good surgical practice for LAA clipping in open cardiac surgery.²⁻⁴ Overall, most adverse events with the AtriClip device involve technical issues, while a minority involve perforation or bleeding, very rarely requiring chest re-exploration.⁵ Left atrioventricular groove injury secondary to LAA clipping, not previously described in the literature, can have significant consequences such as tamponade and bleeding that require re-exploration. Here, we present the case of a 59-year-old male who underwent coronary artery bypass grafting with prophylactic LAA clipping using the new Medtronic Penditure atrial clip, which led to an atrioventricular groove injury requiring chest re-exploration. Patient consent was obtained for the reporting of this case.

CASE REPORT

A 59-year-old male presented to an outside hospital complaining of ongoing chest tightness and pain radiation to the shoulder over the past two days. His medical history included chronic kidney disease, diabetes mellitus, coronary artery disease status post percutaneous coronary intervention to the left anterior descending (LAD) artery and left circumflex artery in 2016, hypertension, and a renal transplant 11 years ago. Laboratory results revealed a creatinine level of 5.46, blood urea nitrogen of 92, glomerular filtration rate of 11, troponin level of 341, white blood cell count of 13.5, hematuria on urinalysis, and an electrocardiogram with nonspecific ST segment changes. Due to elevated troponin levels and dynamic chest pain, cardiology was consulted, and the patient was diagnosed with non-ST-elevation myocardial infarction, type 1 acute myocardial infarction. He was placed on nitroglycerin and heparin drips, transferred to the intensive care unit (ICU), and underwent a left heart catheterization (LHC).

An echocardiogram demonstrated an ejection fraction of 35% to 40%, global impairment with diastolic dysfunction, and wall motion abnormalities. The patient underwent LHC, which revealed multivessel coronary artery disease, 90% to 95% mid LAD stenosis, 100% proximally occluded obtuse marginal 1 (OM1), and 80% mid posterior descending artery (PDA) stenosis. Cardiothoracic surgery was consulted for evaluation, and the decision was made to proceed with coronary artery bypass grafting.

In the operating room, the patient was anesthetized, prepped, and draped. Vein harvest was performed from the left leg. It was decided to use the right internal mammary artery (RIMA) as an in-situ graft to avoid the risk of steal syndrome associated with using the left internal mammary artery due to a previous left arm arteriovenous fistula. A median sternotomy was performed, and the RIMA was harvested in a skeletonized fashion. After conduit harvest, the patient was placed on cardiopulmonary bypass, and an aortic cross-clamp was applied, followed by the administration of 1 liter of cold del Nido cardioplegia antegrade, resulting in excellent cardiac arrest.

The LAD, OM1, and PDA were bypassed in standard fashion. The apex of the heart was elevated, and the base of the LAA was measured. A 45-mm Medtronic Penditure atrial appendage clip was used to exclude the LAA. De-airing maneuvers were performed, and the aortic cross-clamp was released. The heart began to beat spontaneously, and an improvement in ejection fraction was noted compared to the preoperative echocardiogram. The patient was weaned off cardiopulmonary bypass, and transit time flow measurements in the grafts were excellent. Left ventricular function showed marked improvement. Protamine was administered, hemostasis was achieved, chest tubes were inserted, and routine closure of the chest was performed.

After closure and prior to ICU transfer, transesophageal echocardiography revealed a growing hematoma on the posterior aspect of the heart, compressing the left atrium (Figure 1). The sternum was reopened while maintaining sterility, and the heart was elevated, allowing evacuation of a large hematoma. The evacuation revealed bleeding from the atrioventricular (AV) groove adjacent to the Medtronic atrial appendage clip, which had eroded into the heart (Figure 2). The bleeding site was secured with a pledgeted 3-0 Prolene suture and reinforced with topical hemostatic agents. A meticulous inspection confirmed no further bleeding, and the heart was repositioned. The chest was then closed routinely. After confirming stability through echocardiography, hemodynamic monitoring, and chest tube output, the patient was transferred to the ICU in stable condition.

DISCUSSION

Left atrial appendage (LAA) occlusion is an important strategy for stroke prevention in patients with atrial fibrillation who are not candidates for long-term anticoagulation. Various occlusion devices exist, each with unique designs and mechanisms of action. The case presented highlights a complication associated with a mechanical LAA occlusion device that ultimately resulted

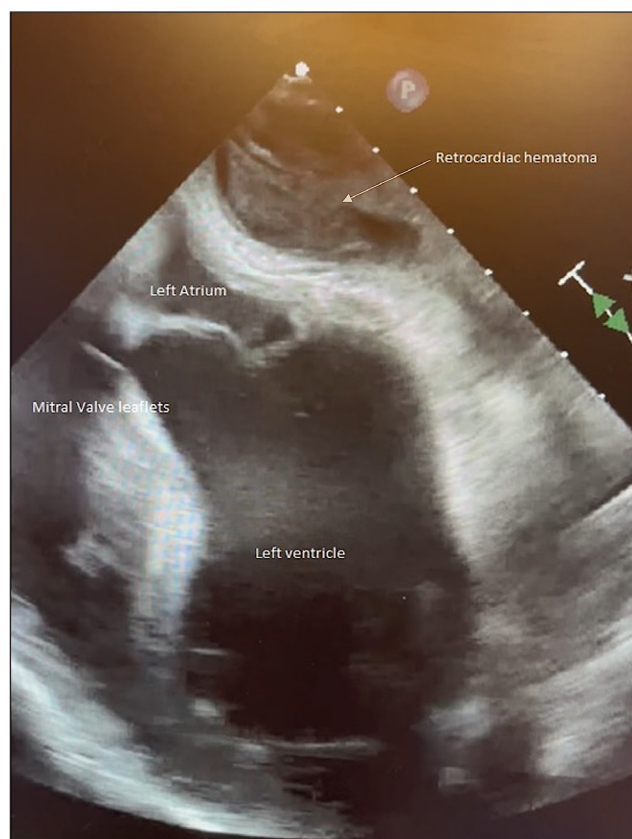


Figure 1 Intraoperative transesophageal echocardiographic image shows left atrial compression secondary to a retrocardiac hematoma caused by the Medtronic Pendent clip.

in left ventricular erosion and tamponade. Atrial fibrillation is a known postoperative complication of open-heart surgery, and LAA closure techniques have become favored as a routine part of such surgeries.⁶ Officially, the Society of Thoracic Surgery recommends LAA obliteration for all first-time nonemergent cardiac surgery procedures to reduce morbidity from thromboembolic complications.⁷

Complications related to LAA occlusion devices have been reported through the US Food and Drug Administration's MAUDE Adverse Events database. Contractor et al. summarized MAUDE database reports of AtriClip adverse events between 2015 and 2021 and found that a majority of reported events (75%) were related to technical issues with the device itself, while a smaller proportion (17%) involved perforation or bleeding.⁵ In a limited number of cases, perforation was associated with technical application issues. In our patient, the Pendent clip was found to be eroded into the AV groove adjacent to the site of clip placement. This was determined to be the origin of bleeding in our patient, which led to a retrocardiac hematoma compressing the left atrium. No bleeding was noted in this area prior to clip placement, suggesting a potential interaction between the device and surrounding structures. It appeared that the clip had applied excess

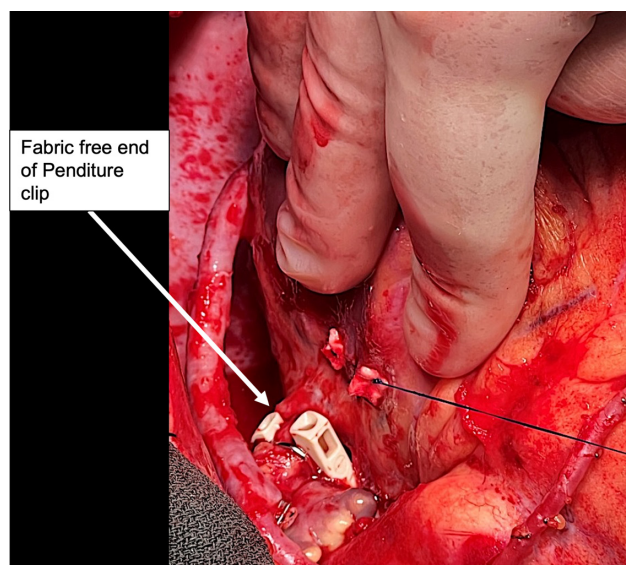


Figure 2 Intraoperative view showing bleeding from the atrioventricular groove adjacent to an eroded Medtronic atrial appendage clip, secured with a pledgeted 3-0 Prolene suture.

compressive force to the AV groove, leading to erosion and subsequent hemorrhage into the posterior aspect of the heart.

A notable design difference of the Pendent clip is its rigid, fabric-free structure, which leaves the metallic surface directly exposed to surrounding tissues. In contrast, some other LAA occlusion devices, such as the AtriClip, incorporate a Dacron fabric covering, which may facilitate endothelialization and reduce direct mechanical stress on adjacent structures. Following this complication, an alternative LAA occlusion device was successfully placed without further issues. This case suggests that the design characteristics of LAA occlusion devices, including clip rigidity, and surface material, may influence their interaction with cardiac structures and long-term safety profile. Further investigation is warranted to assess whether these differences have significant clinical implications.

CONCLUSION

This case highlights a potential complication of the Medtronic Pendent atrial appendage clip, including retrocardiac hematoma due to clip erosion into the AV groove and subsequent left atrial compression. While different LAA occlusion devices have established roles in surgical practice, variations in design—including clip rigidity, and the presence or absence of a fabric covering—may introduce unique risks that warrant further study. Until more data are available, surgeons should be aware of potential interactions between LAA occlusion devices and

surrounding structures and exercise careful intraoperative assessment and postoperative monitoring to mitigate risks.

COMPETING INTERESTS

The authors have no competing interests to declare.

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