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CASE REPORT

INTERMEDIATE

CLINICAL CASE

# Percutaneous Retrieval of an Embolized Transcatheter Mitral Valve Repair Clip Causing ST-Segment Elevation Myocardial Infarction



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## ABSTRACT

Mitral valve repair clip detachment and embolization is a rare phenomenon, with few reported cases. We describe a case of subacute transcatheter mitral valve repair clip embolization presenting as an inferior ST-segment elevation myocardial infarction, with subsequent successful percutaneous device retrieval.

(**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2023;9:101745) © 2023 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## HISTORY OF PRESENTATION

A 76-year-old man presented by ambulance for sudden-onset, crushing, left-sided chest pain associated with nausea, diaphoresis, and dyspnea. Electrocardiogram obtained in the field demonstrated ST-segment elevation in the inferior leads. Physical examination was notable for a grade 4/6 holosystolic apical murmur.

## LEARNING OBJECTIVES

- To recognize potential complications of transcatheter mitral valve repair clip detachment and embolization.
- To describe percutaneous retrieval techniques for device extraction.

## PAST MEDICAL HISTORY

The patient had a history of hypertension and hyperlipidemia. Evaluation for worsening exertional dyspnea over the prior year identified severe mitral valve regurgitation secondary to a flail P2 leaflet. Surgical mitral valve repair was recommended; however, the patient opted for transcatheter mitral valve repair. Two MitraClips (Abbott) were placed at another hospital 8 days before presentation. He tolerated the procedure well and was started on aspirin and clopidogrel.

## DIFFERENTIAL DIAGNOSIS

Differential diagnosis included acute coronary syndrome, pericarditis, and myocarditis.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

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**ABBREVIATIONS  
AND ACRONYMS**

**LFA** = left femoral artery  
**RCA** = right coronary artery  
**RFA** = right femoral artery

**INVESTIGATIONS**

A repeat electrocardiogram obtained on arrival to the emergency department demonstrated ST-segment elevation in the inferior leads with reciprocal ST-segment depression in the lateral leads in the setting of ongoing chest pain. The patient underwent urgent coronary angiography via right femoral artery (RFA) access using a 6-F sheath. Initial fluoroscopy demonstrated 1 clip in the aortic root, while the other remained in the mitral valve position. Initial injection of the left coronary system demonstrated widely patent vessels, with contrast in the aortic root delineating an ostially occluded right coronary artery (RCA). Nonselective angiography of the RCA demonstrated complete ostial occlusion by a transcatheter mitral valve repair clip.

**MANAGEMENT**

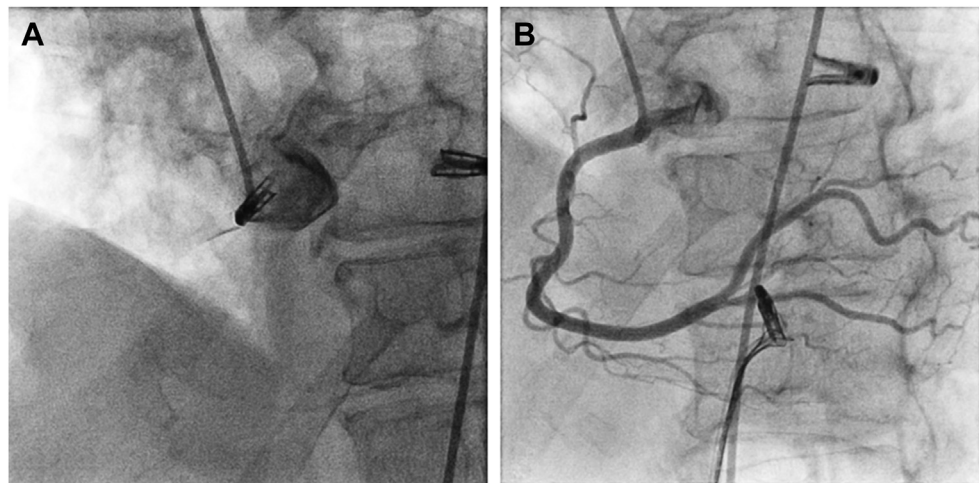
During angiography, the patient developed shock and progressive sinus bradycardia for which a dopamine infusion was started. Intravenous fluid boluses and a norepinephrine infusion were administered to maintain mean arterial pressures above 65 mm Hg. Given the need for additional therapies, an 8-F sheath and a 5-F sheath were placed in the left femoral artery (LFA) and left femoral vein, respectively.

A multidisciplinary evaluation involving cardiothoracic surgery, vascular surgery, interventional radiology, and electrophysiology quickly ensued. The decision was made to attempt to snare the dislodged clip to restore flow to the RCA, with a backup plan for venoarterial extracorporeal membrane oxygenation as a bridge to surgical management in the event of unsuccessful retrieval.

A 6-F 12- to 20-mm EN Snare Endovascular Snare System (Merit Medical) was deployed through the 8-F LFA sheath and successfully captured the clip for withdrawal into the abdominal aorta. Selective angiography of the RCA then demonstrated thrombolysis in myocardial infarction 3 flow without evidence of epicardial coronary artery disease (**Figure 1, Video 1**).

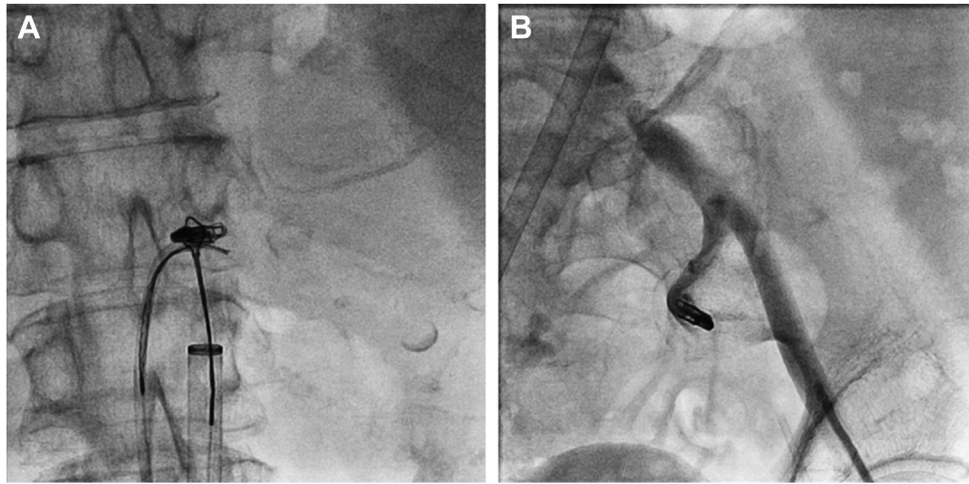
Following restoration of flow, the patient's hemodynamics improved, allowing titration off vasoactive agents. Another multidisciplinary discussion was held to determine the optimal method of removing the clip from the body. Quantitative coronary angiography estimated the diameter of the clip at approximately 5.5 mm.

The decision was made to upsize the RFA sheath to a 20-F GORE DrySeal Flex Introducer sheath (Gore Medical) to safely externalize the clip, with an alternate plan to perform a vascular cutdown for retrieval if percutaneous extraction was unsuccessful. Two Perclose ProGlide devices (Abbott) were used to preclose the arteriotomy before upsizing the sheath.

**FIGURE 1** Coronary Angiography of the Right Coronary Artery

**(A)** The embolized clip is seen occluding the ostial right coronary artery. The residual clip can be seen to the image right. **(B)** Repeat angiography of the right coronary artery after successful snaring of the offending clip to the descending aorta.

**FIGURE 2** Initial Clip Retrieval Attempt



(A) Snare handoff of clip at the iliac bifurcation. The gooseneck snare is visualized extending from the 20-F sheath. (B) Angiogram showing embolization of the clip to the left internal iliac artery.

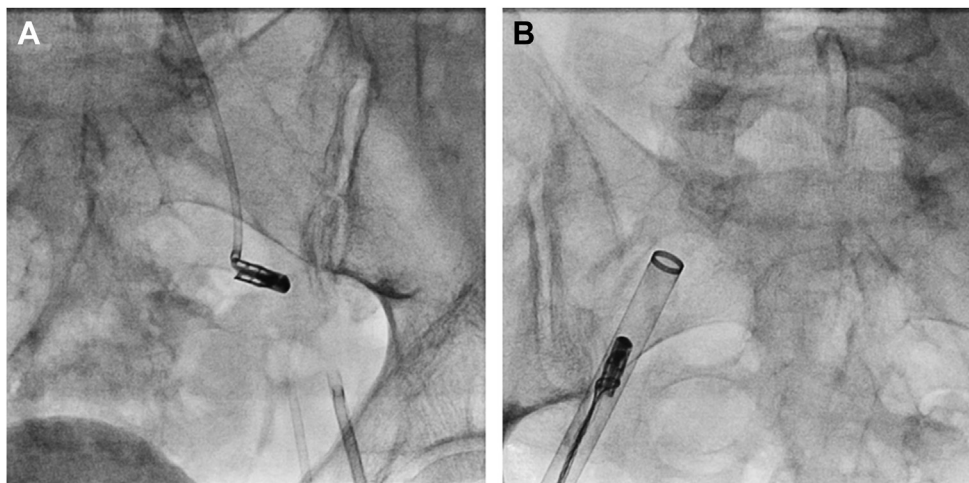
A 10-mm Amplatz Goose Neck snare (Medtronic) was then introduced via the 20-F RFA sheath to snare the clip for retrieval. During snare handoff of the device at the iliac bifurcation, the clip embolized distally to the left internal iliac artery (Figure 2).

A 5-F Rösch inferior mesenteric catheter (Merit Medical) was inserted through the 20-F sheath in the

RFA and guided over a wire across the iliac bifurcation to the left internal iliac artery. The snare was reintroduced and successfully captured the clip for retrieval through the 20-F RFA sheath (Figure 3, Video 2).

Following successful removal of the clip, the RFA sheath was withdrawn and the arteriotomy was

**FIGURE 3** Final Clip Retrieval



(A) A 5-F Rösch inferior mesenteric catheter directed to the left internal iliac artery. (B) Clip withdrawn into the 20-F right femoral artery sheath.

closed with the existing closure devices. A peripheral angiogram was performed via the LFA sheath and showed no evidence of contrast extravasation after deployment of both closure devices (Video 3). All remaining sheaths were removed, and the patient was transferred to the coronary care unit for post-procedural monitoring.

## DISCUSSION

We report a case of delayed transcatheter mitral valve repair clip embolization resulting in complete ostial occlusion of the RCA, causing acute inferior ST-segment elevation myocardial infarction.

Clip detachment and embolization is an exceedingly rare complication. The Society of Thoracic Surgeons/American College of Cardiology Transcatheter Valve Therapy Registry reported a total of 12 cases of device embolization of 12,344 procedures performed between November 2013 and September 2017, for an incidence of <0.1%.<sup>1</sup>

Of the few case reports describing clip embolization, most occurred acutely during placement.<sup>2</sup> Only 1 other published case described delayed clip device embolization several weeks after the index procedure, also to the coronary ostium.<sup>3</sup> This predilection for embolization to the aortic root may be related to the physiologic formation of eddy currents in the sinus of Valsalva during systole, which prevent aortic valve leaflets from occluding the coronary ostia.<sup>4</sup>

Most of the reported cases achieved device externalization via transseptal (venous) access, using large bore sheaths up to 26-F in size.<sup>5</sup> Only 2 other cases describe clip retrieval via a transfemoral aortic approach, with both cases ultimately requiring surgical cutdown for device externalization.<sup>2,3</sup> To our knowledge, we present the first successful percutaneous retrieval of an embolized clip via a transfemoral aortic approach.

Significant intraprocedural planning was required for successful device extraction, involving rapid input from multiple teams. A major challenge in this case lay in the selection of an appropriately sized catheter for successful device removal. The transcatheter mitral valve repair clip has undergone multiple revisions since its initial introduction in 2003, resulting in a potential deployed device diameter ranging between 4 and 6 mm.<sup>6</sup> This case was complicated by the immediate unavailability of procedure details from the hospital where the implantation was performed. Our use of quantitative coronary angiography to estimate the diameter of the clip presents one method by which retrieval catheter sizing may be estimated when device information is

unavailable. Alternatively, given that the current largest possible arm width of a fully deployed transcatheter mitral valve repair clip is 6 mm, a 20-F internal diameter sheath should suffice for device extraction with appropriate coaxial orientation of the clip.

Because the initial snaring of the clip had been performed via the smaller 8-F LFA sheath, a 2-snare approach was necessary to hand off the device for percutaneous extraction via the subsequently upsized RFA sheath. The EN Snare device, with its multiple loops, allowed for easier initial capture of the clip, while a gooseneck snare was initially selected as the secondary snare to reorient the clip for withdrawal into the retrieval sheath. A low anatomic site for handoff (at the iliac bifurcation) was chosen to minimize the risk of significant end-organ injury in the event of possible device release and re-embolization.

## FOLLOW-UP

A postprocedural transthoracic echocardiogram showed a left ventricular ejection fraction of 55% without regional wall motion abnormalities and preserved right ventricular function. Severe eccentric, anteriorly directed mitral valve regurgitation was also identified, with the remaining clip adherent only to the anterior leaflet of the mitral valve. There were no postprocedural complications. The patient was discharged with plans for surgical mitral valve repair by his primary valve team.

## CONCLUSIONS

Subacute transcatheter mitral valve repair clip embolization is a rare phenomenon, more commonly described during initial device placement. To our knowledge, we report the first case of successful percutaneous arterial transfemoral retrieval of an embolized clip presenting as an acute inferior ST-segment elevation myocardial infarction caused by occlusion of the ostial RCA.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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**KEY WORDS** mitral valve, myocardial infarction, valve repair

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 **APPENDIX** For supplemental videos, please see the online version of this paper.