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**DOI:** 10.4244/EIJ-D-19-00942

**Citation:** Khalid N, Shlofmitz E, Case BC, Waksman R. Chordae Tendineae Rupture and Iatrogenic Severe Mitral Regurgitation Related to Impella. *EuroIntervention* 2020; Jaa-730 2020, doi: 10.4244/EIJ-D-19-00942

**Manuscript submission date:** 15 October 2019

**Revisions received:** 02 January 2020

**Accepted date:** 14 February 2020

**Online publication date:** 18 February 2020

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## **Chordae Tendineae Rupture and Iatrogenic Severe Mitral Regurgitation Related to Impella**

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**Running Title:** Chordae Tendineae Rupture, Iatrogenic Severe MR

**Disclosures:** Ron Waksman – Advisory Board: Amgen, Boston Scientific, Cardioset, Cardiovascular Systems Inc., Medtronic, Philips, Pi-Cardia Ltd.; Consultant: Amgen, Biotronik, Boston Scientific, Cardioset, Cardiovascular Systems Inc., Medtronic, Philips, Pi-Cardia Ltd.; Grant Support: AstraZeneca, Biotronik, Boston Scientific, Chiesi; Speakers Bureau: AstraZeneca, Chiesi; Investor: MedAlliance.

All other authors have no conflicts of interest to declare.

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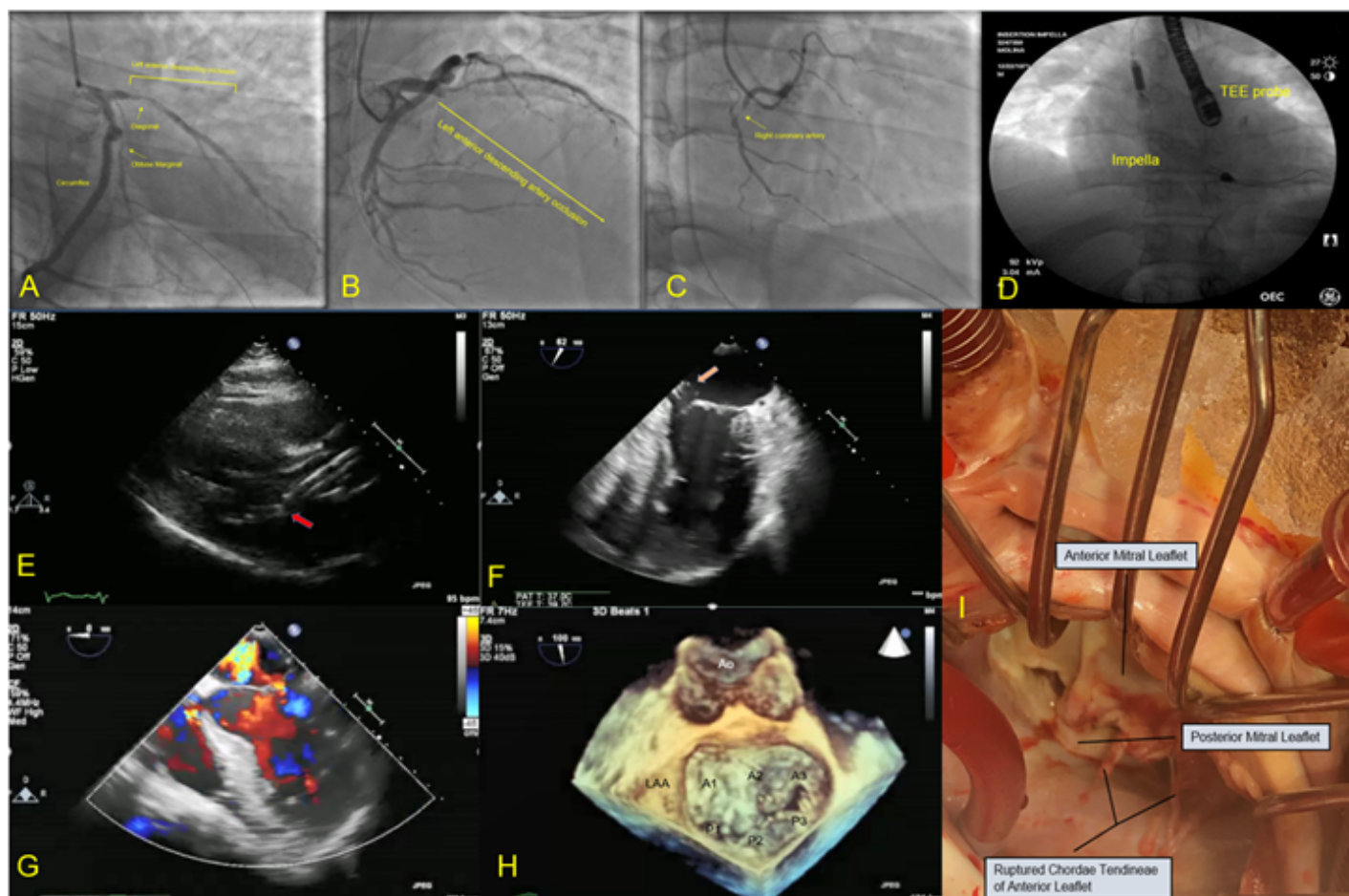
**Classifications:** STEMI; Mitral regurgitation; Ventricular assist device; Transesophageal echocardiogram

A 47-year-old man presented with witnessed out-of-hospital cardiac arrest at his wedding and anterior ST-elevation myocardial infarction. Initial blood pressure was 90/60 mmHg with pulse of 115 beats/minute. Coronary angiography showed 100% thrombotic occlusion of the proximal left anterior descending artery with Thrombolysis in Myocardial Infarction (TIMI)-0 flow, 90% disease in the proximal first diagonal, 80% disease in the small-caliber obtuse marginal-1, and 90% disease in the non-dominant mid right coronary artery (Figure 1A-C). Aspiration thrombectomy was performed with Pronto® LP Extraction Catheter (Teleflex, Inc., Wayne, Pennsylvania, USA), restoring sluggish flow. A 3.0x38 mm Xience (Abbott Vascular, Chicago, Illinois, USA) drug-eluting stent was deployed, establishing TIMI-3 flow. Hemodynamic support was provided with intra-aortic balloon counterpulsation and dopamine infusion. The patient developed significant hypoxemia and pulmonary edema requiring intubation, mechanical ventilation, and intravenous furosemide. Because of refractory cardiogenic shock, the patient was transferred to our hospital for advanced mechanical support. Workup showed lactate of 5.5 mmol/L and peak troponin-I of 90 ng/mL. After heart-team discussion, the patient underwent transaxillary Impella 5.0 (Abiomed Inc., Danvers, Massachusetts, USA) implantation. Within 48 hours, the patient's hemodynamics improved; he was extubated and remained neurologically intact. Impella was weaned; however, the patient continued to report significant orthopnea. Chest X-ray demonstrated persistent pulmonary congestion. Transthoracic echocardiogram (TTE) showed Impella inlet entrapment in the mitral subvalvular apparatus (Figure 1E, Video 1) and moderate mitral regurgitation (MR). The patient underwent Impella explantation after 96 hours; however, MR degree remained unchanged. Console data review did not show any alarms or malfunction. To better define the etiology (ischemic versus iatrogenic) and degree of MR, transesophageal echocardiogram (TEE) was performed, which showed severe eccentric MR (Figure 1F-G, Videos 2-3), while three-dimensional TEE showed flail A3, P3 scallops (Figure 1H, Video 4). Because of extensive damage noted intraoperatively (ruptured chordae tendineae, Figure 1I), mitral valve repair was not feasible, and the patient underwent bioprosthetic mitral valve replacement. Left internal mammary to diagonal and saphenous vein to left posterolateral branch bypass grafting were also performed. Though rare, our case highlights an important complication of Impella-related chordal rupture and severe MR. Echocardiography is valuable to verify proper placement initially and on follow-up. Optimal placement of the Impella device is accomplished by positioning the inlet approximately 3.5 cm from the aortic valve annulus and avoiding posterior placement of the device toward the mitral valve leaflets. Accurate device positioning is critical to prevent mechanical valve injury.

## Figure Legend

**Figure 1:** (A-C) Coronary angiography; (D) Cinefluoroscopy of Impella in-situ (E) (E)TTE (parasternal long axis) – Impella abutting mitral valve (arrow); (F) TEE showing flail P3 scallop (arrow); (G) color TEE showing severe eccentric MR; (H) 3D-TEE showing flail A3/P3 scallops; (I) Ruptured chordae tendineae.

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## SUPPLEMENTAL MATERIAL

### Video Legends

**Video 1:** Transthoracic echocardiogram (parasternal long axis view) showing an Impella abutting the mitral valve (red arrow)

**Video 2:** Transesophageal echocardiogram showing a flail P3 scallop (red arrow)

**Video 3:** Color transesophageal echocardiogram showing severe eccentric mitral regurgitation

**Video 4:** Three-dimensional transesophageal echocardiogram showing flail A3 and P3 scallops

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