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Iatrogenic perforation of aortic valve cusp as a complication of percutaneous coronary intervention

Short title: PCI-induced aortic valve perforation

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A 64-year old obese male, former smoker, was hospitalized due to de novo heart failure with reduced ejection fraction (HFrEF) diagnosis. The patient reported increased fatigue and episodes of chest pain and palpitations during physical activity in the past 1–2 years (New York Heart Association [NYHA] classification II, Canadian Cardiovascular Society [CCS] classification II). Echocardiography revealed decreased left ventricular ejection fraction (LVEF) (25%–30%), akinesia of the basal and middle segments of the inferior wall and hypokinesia of the remaining LV segments, without significant valve pathologies.

Left coronary artery angiography revealed significant proximal left anterior descending artery (LAD) stenosis. Catheterisation of right coronary artery (RCA) required multiple diagnostic

catheters (JL-3.5/6F, JR-4.0/6F, 3DRC/6F, AL 2.0/6F, AL 1.0/6F, AR 1.0/6F) and the RCA injection was sub-selective. Significant proximal stenosis of RCA was suspected. RCA intubation was achieved with a DRC/6F catheter and finally instantaneous wave-free pressure ratio (iFR)/fractional flow reserve (FFR) measurements ruled out the significance of RCA stenosis. The LAD was successfully treated with drug-eluting stent (DES) implantation. The patient did not report any symptoms and no significant cardiac murmur was noticed. The medical therapy was optimized, and the patient was discharged on the following day with a scheduled admission in 3 months for re-evaluation and implantable cardioverter-defibrillator (ICD) qualification.

On next elective admission the patient reported a significant reduction of previously reported symptoms (NYHA I, CCS I). Diastolic murmur 2/6 was audible and blood pressure was 115/50 mm Hg. There was no fever or other signs of inflammation. C-reactive protein (CRP) was normal. As previously, the global left ventricular hypokinesia was visualized in transthoracic echocardiography, however, with an increase in LVEF up to 40% with a simultaneous increase in LV end-diastolic dimension (LVEDD) from 60 to 66 mm (LV end-diastolic volume (LVEDV) from 260 to 310 ml). Moreover, the presence of previously absent mobile subvalvular structure in left ventricular outflow tract (LVOT) (up to 8 mm) was noted (Figure 1A). It was confirmed by transesophageal echocardiography showing moderate/severe aortic regurgitation due to iatrogenic perforation of the non-coronary cusp (Figure 1B–D). The patient was again presented to Heart Team and qualified to surgical valve replacement, which was successfully performed (Figure 1E, F). The damaged valve was removed and a SJM 25A mechanical aortic valve was implanted. The postoperative course and wound healing were uneventful. The patient was discharged from the hospital in good general condition and sent for rehabilitation.

The iatrogenic perforation of the aortic valve represents a very rare complication of percutaneous coronary intervention. Its approximate prevalence is 0.0001% and only 16 similar cases have been reported in the literature [1]. It must be taken into account when forceful technique has to be used to intubate the coronary artery. Mostly clinical presentation is acute, and it results from the laceration or perforation of a cusp via the catheter [1]. In our case the course was almost asymptomatic but led to progressive dilatation of the left ventricle. It is possible the tear of the leaflet progresses during the 3 months of follow-up. It was important to differentiate the mechanical cause from infective endocarditis [2]. According to the largest so far systematic review, aortic valve replacement is the most common treatment [1]. In

accordance with the current guidelines, the Heart Team is decisive in qualifying for the appropriate treatment method of that rare complication [3–5].

Article information

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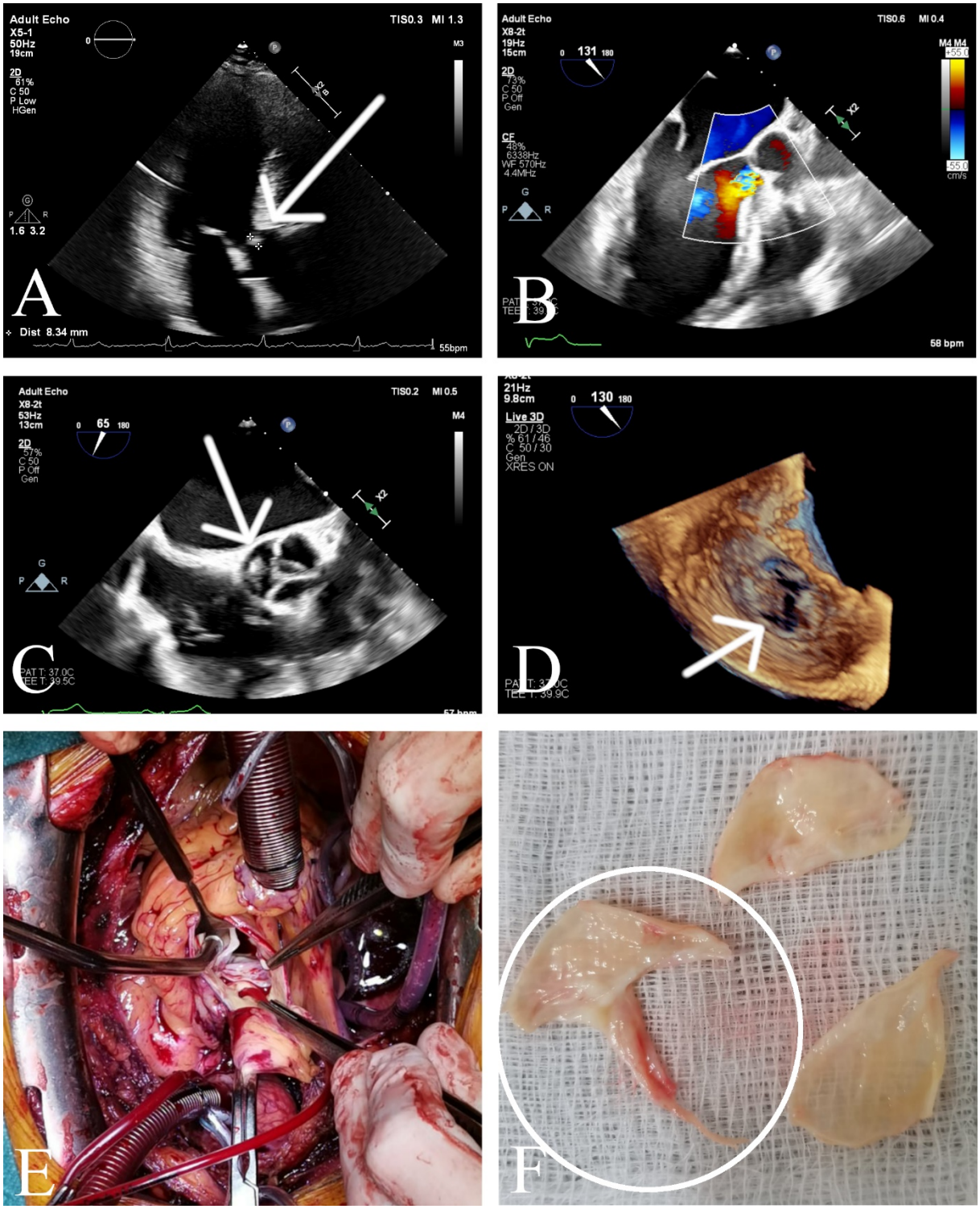

Figure 1. A. 2D transthoracic echocardiogram, apical 5 chamber view — 8 mm long structure in left ventricular outflow tract (arrow). **B.** 2D transesophageal echocardiogram, ME LAX view — severe aortic regurgitation. **C, D.** 2D and 3D transesophageal echocardiogram, ME aortic valve SAX view — perforation of non-coronary aortic cusp (arrows). **E, F.** The cardiac surgery with aortic valve replacement. The perforated cusp was marked with the circle

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