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Percutaneous coronary intervention for iatrogenic occlusion of the circumflex artery (Cx) following mitral valve replacement surgery

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Iatrogenic coronary artery occlusion is a rare and frequently overlooked but life-threatening complication of mitral valve surgery [1]. The incidence is reported to be 0.15% to 1.8% of all cardiac-procedures [4].

Although the possibility of such a complication has been known for a long time, the increasing number of cardiac surgeries cause that the awareness of this complication has not lost its importance, which is confirmed by the current prevention and management algorithms published in 2021[4]. There are still no unified standards and guidelines for the treatment in such clinical situations. Even expert positions is missing [5]. The risk of damage to the circumflex coronary artery (Cx) is caused by its proximity to the posterior segment of the mitral annulus [2]. The most common pathomechanism is direct damage to the circumflex artery in the mechanism of: suture ligation, laceration or annuloplasty device distortion during mitral valve repair [3].

The case of a 73-year-old patient with severe mitral regurgitation, clinically known single-vessel ischaemic heart disease, chronic NYHA III heart-failure, and persistent atrial fibrillation (AF) is presented. He was admitted to the Department of Cardiac Surgery for surgical treatment.

Transthoracic echocardiography (TTE) examination revealed: mildly-reduced left ventricular ejection fraction (LVEF, 48%), enlarged left atrium (LA, 5.6 cm), enlarged left ventricle (LV, 5.7 cm), interventricular-septum-hypertrophy (IVSD, 1.3 cm). The patient underwent surgical implantation of a biological mitral valve prosthesis (Perimount-27, Edwards-Lifesciences) combined with coronary artery bypass grafting (Left-Internal-Mammary-Artery to Left Anterior Descending-Artery, LIMA-LAD) and surgical ablation of the AF substrate in the left atrium.

The cardiac surgery was performed under extremely challenging anatomical conditions, and this may explain the occurrence of the complication. The procedure was performed via medial sternotomy and extracorporeal circulation. The heart was enlarged. There were poor anatomical conditions: a deeply located atrium with a corrugated wall. Due to the chordal rupture and restricted anterior-mitral-valve-leaflet mitral valve plastic surgery was not performed. The subvalvular apparatus was left. Bioprosthetic valve was implanted with single mattress sutures.

After the surgery, the 12-lead-electrocardiogram revealed the acute inferior myocardial infarction with ST-segment elevation (Figure 1A). In laboratory tests a significant increase in cardiac troponin I was detected (18043.3 ng/l; n <46.47 ng/l). The TTE revealed: decreased left ventricular systolic function (EF, 43%), hypokinesis of the inferior wall, proper valve function with no paravalvular leak, mean gradient of 6 mmHg, maximum-gradient of 17 mm Hg). Urgent coronary angiography was performed, confirming iatogenic closure of Cx (Figure 1B–D). Due to the fact that the Cx closure was diagnosed after the end of cardiac surgery, according to the currently proposed algorithm, it was decided to attempt percutaneous intervention [4]. At the same time successful percutaneous coronary intervention of Cx was performed: after numerous predilatations with balloons of progressively larger sizes, slowly escalating the inflation pressures, carefully observing the modeling of the vessel on the balloon.

The gradation of the sizes of the balloons (Mini Trek: 2.0/15; Trek: 2.5/20; Abbott) used was applied as an equivalent of intravascular ultrasound (IVUS) assessment, as it was not possible to perform it in the on-call conditions. Another justification for this approach was to carefully test for a potentially possible tear or cut on the Cx balloon caused by its stitching. Finally, after the use of the last balloon (NC:Solarice 3,0/20; Medtronic) , due to the “recoil” of the vessel, a drug-eluting stent (DES:Xience 3.5/25, Abbott) was implanted with a very good angiographic effect (Figure 1E–F). The patient was discharged home 9 days after surgery in good condition.

Article information

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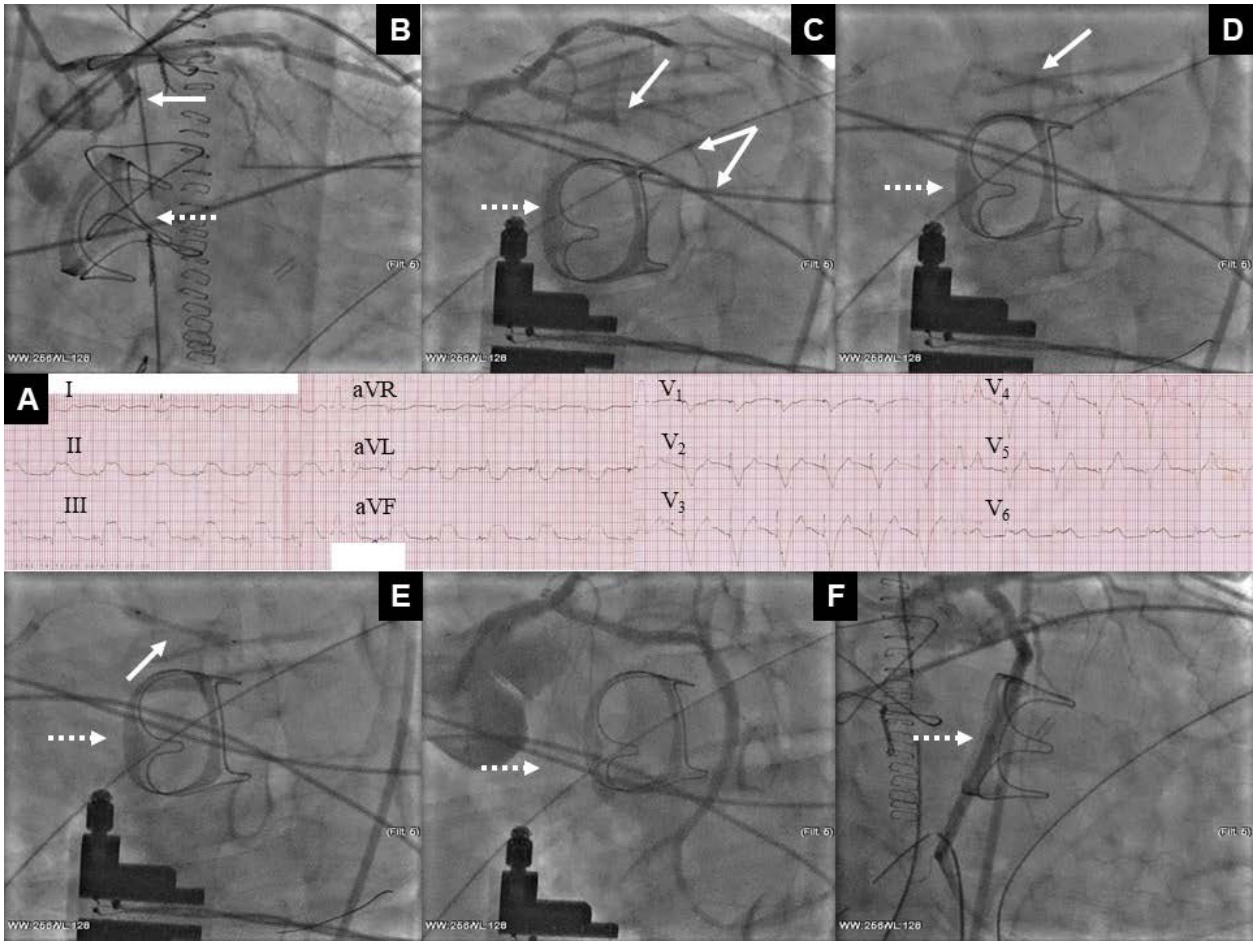

Figure 1. A. ECG: effective ventricular pacing with visible ST-T segment elevations on the inferior wall (leads II, III and aVF) and lateral wall (lead V_6) with ST-T and reciprocal mirror reflections on the anterior wall (leads I and aVL). ECG recorded at a paper speed of 25 mm/s and a voltage of 10 mm/mV. **B.** CA (RAO 26, CAU 24): occlusion in proximal part (eleventh segment) of the CX (the arrow is pointing at the occlusion site) close to the mitral valve bioprosthesis (dashed arrow). **C.** PCI (LAO 26, CAU 18): occlusion in proximal part (eleventh segment) of the CX (the arrow is pointing at the occlusion site) close to the mitral valve bioprosthesis (dashed arrow); the double solid arrows are pointing to the guidewire. **D.** PCI (LAO 32, CAU 18): an angioplastic balloon inflation in proximal part (eleventh segment) of the CX (solid arrow); the dashed arrow is pointing to the mitral valve bioprosthesis. **E.** PCI (LAO 32, CAU 18): the initial stage of stent expansion at the lesion site with visible modeling in the center of the balloon in proximal part (eleventh segment) of the CX (solid arrow); the dashed arrow is

pointing to the mitral valve bioprosthesis. **F. (on the left)** CA (LAO 36, CAU 13) and **(on the right)** — CA (RAO 8, CAU 31): good final angiographic result with TIMI 3 flow; the dashed arrow is pointing to the artificial valve

Abbreviations: CA, coronary angiography; CAU, caudal view; CX, circumflex branch of left coronary artery; EKG, electrocardiogram; LAO, left anterior oblique view; PCI, percutaneous coronary intervention; RAO, right anterior oblique view