Multimodality imaging for interventional planning and device closure of an atypical ventricular septal defect occurring late after myocardial infarction

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A 75-year-old male was transferred to our clinic with suspected ventricular septal defect (VSD) and acute decompensated chronic heart failure New York Heart Association (NYHA) Class IV. He had a history of posterior STEMI 1 month prior to the actual admission with implantation of three drug-eluting stents (DESs) in the right coronary artery (RCA).

Three-dimensional (3D) transoesophageal echocardiography (TOE) revealed a medium-sized VSD in the pars membranacea of the ventricular septum with a continuous left-to-right shunt (Panel A).

Cardiac catheterization showed patent DESs in RCA, post-capillary pulmonary hypertension, and relevant left-to-right shunting via VSD (Qp/Qs 1.4).

Heart team decision was made to avoid open-heart surgery because of relevant co-morbidities (Euroscore II 7.09%) and the poor general condition of the patient.

For planning of interventional defect closure, we performed additional cardiac magnetic resonance imaging and multislice computed tomography (Panels B and C). Non-invasive imaging confirmed VSD location in the centre of a transmural myocardial scar inferoseptal, having evolved, supposedly, from a pre-existing, small VSD. Since determination of defect size remained unclear, interventional defect sizing was planned immediately before VSD closure with real-time 3DTOE guidance.

After placing a rubber wire using a 5 french Terumo Angled Tapered Glide catheter (Terumo Medical Corporation, Somerset, NJ, USA) retrograde across the defect, an arterio-venous loop by snaring the wire in the left ventricle using a 20 mm multi-snare after transvenous femoral access (BBraun, Melsungen, Germany) was established. Defect size was confirmed with 14 mm by using a 24 mm Amplatzer sizing balloon II (Panel D) and finally an Amplatzer Muscular VSD 16 mm Occluder (Amplatzer, St Jude Medical, Plymouth, MN, USA) was deployed via an Amplatzer TorqueVue sheath (Panel E). Three-dimensional TOE confirmed proper device positioning with subtotal acute defect closure (Panel F). The patient was discharged on Day 7 after the procedure with NYHA Class II, which further improved to NYHA Class 0–1 month after the procedure.

This is a rare case of a late VSD after STEMI with mixed aetiology. Multimodal imaging was indispensible for procedural planning and peri-interventional guidance of interventional defect closure.

Periprocedural multimodal imaging of the VSD and interventional closure procedure. (Panel A) Three-dimensional Doppler image of the ventricular septal defect: the VSD is located in the pars membranacea of the interventricular septum. (Panel B) Cardiac magnetic resonance imaging showing the VSD being located just distal of the left ventricular outflow tract. (Panel C) Three-dimensional reconstruction of a multisliced cardiac computed tomography dataset, revealing the exact VSD location. (Panel D) Procedural sizing of the VSD using an Amplatzer Sizing Balloon II. (Panel E) Fluoroscopy of the implanted VSD occluder in place. (Panel F) Evaluation of VSD occluder positioning and rest shunt using two-dimensional echocardiography.