A novel hybrid approach to nonsurgical septal reduction in hypertrophic obstructive cardiomyopathy

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A 73-year-old male patient with a history of hypertension and dementia presented to the emergency department with symptoms of palpitation and syncope. An electrocardiogram showed monomorphic ventricular tachycardia, and electrical cardioversion was performed immediately to restore sinus rhythm. Transthoracic echocardiography demonstrated an interventricular septum thickness of 23 mm, systolic anterior motion of the anterior mitral valve leaflet, and a resting left ventricular outflow tract (LVOT) gradient of 95 mm Hg. Coronary angiography showed atherosclerotic coronary artery disease without significant stenosis as well as one dominant and multiple small septal arteries (Figure 1A; Supplementary material, *Video S1*). Firstly, a dual-chamber implantable cardioverter defibrillator was implanted, and guideline-directed medical therapy was initiated. Despite the medical therapy, the patient remained symptomatic, so septal reduction therapy was considered.

Because the patient refused surgery, he was scheduled for septal embolization; however, there were multiple small septal arteries and one dominant septal artery. Therefore, the Heart Team decided to occlude the dominant septal artery with a novel approach. According to this approach, we planned to occlude the dominant septal artery with a bare-metal stent (BMS) covered by a cut balloon tip. We chose a BMS and a balloon with diameter one-to-one with the vessel diameter, then we cut the 2.5 × 15 mm balloon tip, removed the shaft (Figure 1B), and inserted a 2.5 × 10 mm BMS into the balloon tip (Figure 1C). A workhorse guidewire was passed through the septal artery, and a prepared BMS-balloon tip was mounted on the guidewire and embedded into the septal artery (Figure 1D–E; Supplementary material, *Video S2* and *S3*). Transthoracic echocardiography showed decreasing systolic anterior motion and an LVOT gradient of 58 mm Hg. Since adequate gradient reduction could not be achieved, alcohol septal ablation (ASA) was performed on the three small septal arteries (Supplementary material, *Video S4*), and finally, an LVOT gradient was reduced to 32 mm Hg. The patient was discharged on day 7 after the procedure. At 2-month follow-up, the patient was asymptomatic; an LVOT gradient decreased to 14 mm Hg, and control coronary angiography showed completely occluded septal arteries (Figure 1F; Supplementary material, *Video S5*).

Nonsurgical techniques have been used frequently to reduce septal mass and LVOT obstruction by producing septal infarction. Notwithstanding that ASA is the standard approach, there are several techniques, such as coil embolization [1], cyanoacrylate mixture [2], microsphere embolization [3], and subcutaneous fat tissue [4]. The BMS-balloon tip technique, a novel inexpensive, and easily applicable embolization technique was performed for the first time in hypertrophic obstructive cardiomyopathy. The classic cut balloon technique (CBT) involves putting a cut balloon tip on the guidewire, with another balloon placed behind it to advance to the target area. This technique is versatile and applicable in various embolization procedures such as distal coronary perforation, fistula embolization, bypass graft side branch occlusion, and tumor debulking [5]. However, unlike the BMS-balloon tip technique, which uses a stent to stabilize the balloon tip at the intended occlusion site, the cut balloon technique lacks this stabilization. While valuable

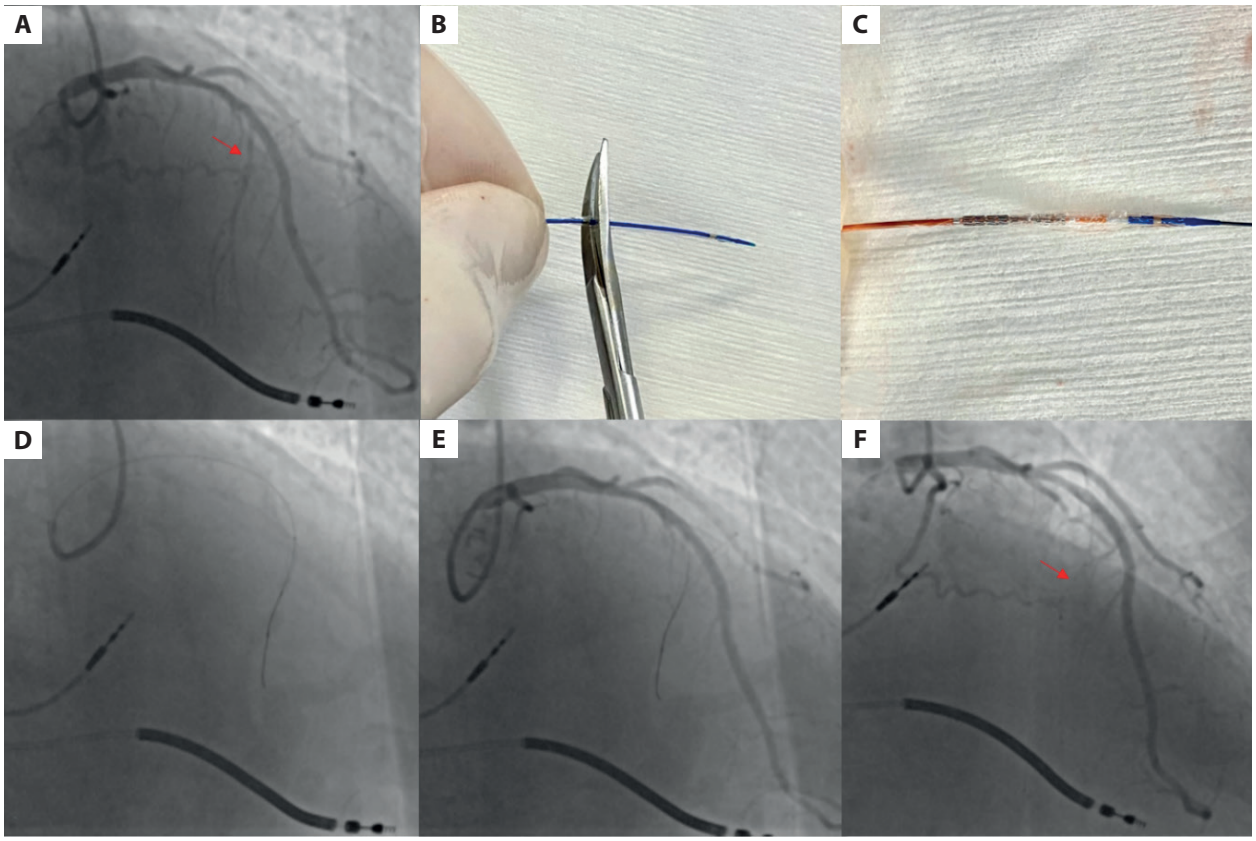

Figure 1. A. One dominant septal artery and multiple small septal arteries (red arrow). **B.** A 2.5 × 15 mm balloon tip with the removed shaft. **C.** A 2.5 × 10 mm bare-metal stent (BMS) inserted into the balloon tip. **D.** The BMS-balloon tip was advanced into the dominant septal artery. **E.** The dominant septal artery was occluded with the BMS-balloon tip. **F.** Angiography showed completely occluded septal arteries (red arrow)

and feasible, a major drawback is the inability to retrieve the balloon component, which makes embolization risky. ASA or other embolization techniques alone are mostly sufficient to reduce the LVOT gradient. In this case, the occlusion of the dominant septal artery did not provide sufficient gradient reduction; hence ASA was performed on the other small septal arteries.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/polish_heart_journal.

Article information

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