Transapical Coronary Artery Intervention
“First-in-Man” Experience

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The transfemoral and the transradial approach are the standard access routes for coronary angiography and percutaneous coronary interventions. A transapical left ventricular access is sometimes used for diagnostic purposes and has been described for structural cardiac interventions, but not for coronary artery interventions.1–4 A significant number of patients who undergo catheter-based aortic valve implantation also require coronary intervention. In selected cases, it may be desirable to perform coronary revascularization via the transapical access, for example if aortic disease makes a transfemoral or transradial approach impossible or may lead to complications. We report a case of successful transapical coronary intervention in a patient undergoing transapical catheter-based aortic valve implantation.

Case
A 92-year-old male patient with severe symptomatic aortic stenosis (valve area, 0.4 cm²; peak pressure gradient, 87 mm Hg; mean pressure gradient, 47 mm Hg), diabetes, renal failure (epidermal growth factor receptor, 28 mL/min per 1.73 m²), obstructive pulmonary disease, and EURO score of 13 (predicted operative risk, 49%), was scheduled for catheter-based aortic valve implantation. Invasive coronary angiography via the transfemoral approach was complicated by dissection of the iliac artery and revealed a high-grade stenosis (80%) of the mid left anterior descending coronary artery (LAD). Due to extensive peripheral vascular disease, the transapical approach was chosen for aortic valve implantation. Because of the prior complication via the transfemoral route and lack of sufficiently palpable radial pulses, a single-stage procedure combining coronary intervention and valve implantation via the left transapical approach was considered. First, a left anterolateral minimal thoracotomy was performed. Two purse string sutures were placed into the left ventricular apex and lateral to the LAD. The ventricle was punctured and a 14-French sheath was placed. A guide wire was advanced via the aortic valve and a 6F multiaccess catheter-3 guiding catheter passed through the aortic valve to intubate the left coronary ostium. No hemodynamic consequences were observed after passing the catheter through the aortic valve. Two coronary guide wires (Runthrough, Terumo and Galeo F, Biotronik) were placed into the LAD as backup support. Subsequently, the LAD stenosis was treated by direct placement of a drug eluting stent (Integrity Resolute 3.5/15; Figure A-D). After removal of the coronary guide wires and catheter, aortic valve implantation (Edwards-Sapien, 23 mm) was performed successfully and without any complications via the 14-French sheath already in place. The patient was discharged from the hospital 10 days after the procedure in good general condition.

Discussion
To our knowledge, we report the first coronary artery intervention via a transapical approach. Since the 1950s, transapical procedures using left ventricular apical puncture have mainly been performed to provide hemodynamic data in the presence of mechanical prosthetic valves, ventricular angiography, and more recently, for paravalvular leak closures.1–3 It has been shown that left ventricular apical puncture is associated with a significant number of major complications including hemothorax and pericardial tamponade.4 In patients scheduled for transapical aortic valve implantation, however, a sheath needs to be placed anyways and in selected cases, the risks associated with transapical coronary intervention may be lower than those of a transfemoral or transradial access. In the case reported here, we were able to show that transapical stenting of the LAD coronary artery was feasible and could be performed without major complications. Although successful in this case, the transapical access has limitations. A MAC-3 guiding catheter provided appropriate support in our case, but the choice of potentially suitable catheter shapes seems limited and the lack of options may cause problems in bailout situations. The design of dedicated catheter shapes may be required. We used a 6F catheter, but larger catheters might be desirable for thrombectomy, rotablation, or interventions that require simultaneous placement of 2 stents.
stenotic aortic valve with a 6F catheter and especially with larger devices might lead to hemodynamic instability. Performing the percutaneous coronary intervention after transapical catheter-based aortic valve implantation would avoid this problem. However, we would consider a percutaneous coronary intervention–first approach to be more appropriate because relevant stenoses should be revascularized prior to valve implantation, which occurs during rapid pacing and is often accompanied by temporary hemodynamic deterioration of the patient, potentially causing ischemia if major coronary stenoses are left untreated.

In our opinion, transapical coronary artery intervention may be a useful addition to the interventional spectrum in high-volume centers performing catheter-based aortic valve implantation and should be additionally evaluated regarding optimal equipment, procedural technique, outcome, and complications.

Figure. A. Angiography obtained via the transapical route. The stenosis of the left descending coronary artery (LAD) is visualized. B. Placement of s drug–eluting stent (Integrity Resolute, 3.5/15 mm) in the proximal LAD. C. Stent implantation. D. LAD after stent implantation.

Disclosures
None.

References

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