

## Anesthesia for percutaneous transcatheter closure of atrial septal defects in adults

### *Erişkin hastalarda perkütan transkateter atriyal septal defekt kapatılmasında anestezi*

The percutaneous transcatheter device closure of cardiac and extra-cardiac defects is a preferred method because of reduced morbidity and mortality, shorter hospital stay, superior cosmetic results, avoidance of cardiopulmonary bypass, decreased cost and less postoperative pain (1, 2). The aim of our study was to investigate the anesthetic management of percutaneous closure of atrial septal defects (ASD).

A retrospective review of anesthesia management data of 106 patients who underwent transcatheter closure of ASD between the years 2004-2009 was conducted. Demographic data, systolic pulmonary artery pressure, procedure time, anesthesia time, ASD size, device size, incidence of failure to deploy the device, incidence of need for surgery, the anesthetic drugs used, complications seen during or after the procedure and hospitalization time in the cardiac intensive care unit (ICU) were recorded.

The mean age of 106 patients (44 men and 62 women) was 37.4±14.04 years. The mean procedure and anesthesia time were 36.5±16.8 and 45.6±18.4 minutes. Mean size of the atrial septal defects and the septal occluder devices were 16.0±4.4 mm and 19.9±5.5 mm. Amplatzer septal occluder was used in 94.3% and Occlutech Figulla septal occluder was used in 5.7% of patients. All procedures were performed under general anesthesia. The procedure was finished without any complications in 103 patients. Two patients had severe bradycardia. Thrombus formation on the device was seen in one patient. No major arrhythmias or hypotension occurred during the procedure. After the procedure, all patients were hospitalized in the cardiac intensive care unit with a median discharge time of 12 hours (6-96 hours). Ninety-five patients (88.8%) were discharged from the hospital without any complications. The mortality rate was 0.

Many anesthetic drugs have been used for diagnostic and interventional cardiac catheterizations. Tosun et al. (3) compared dexmedetomidine-ketamine and propofol-ketamine combinations in spontaneously breathing children undergoing cardiac catheterization and dexmedetomidine-ketamine combination resulted with insufficient sedation and analgesia and a longer recovery time. Koruk et al. (4) showed that both dexmedetomidine and ketamine used with propofol were well tolerated in children who required ASD closure. Kogan et al. (5) used propofol-ketamine mixture safely in children undergoing cardiac catheterization. Laussen et al. (6) used sedation for the closure of muscular VSDs in their series, but later they changed their anesthetic management to general anesthesia because of high urgent intubation need due to hemodynamic instability. We used propofol induction in adults with 1 µg/kg fentanyl as our routine anesthetic management. We did not see hemodynamic instability in any of the patients during induction and also we concluded that rapid recovery with propofol was an advantage for this patient group.

The experience with the anesthetic management of percutaneous transcatheter closure of ASD is improving with the new technology of devices and delivery systems. We concluded that general anesthesia is a more safe and comfortable method for the anesthetic management of percutaneous ASD closure because of the risk of hemodynamic instability, the need for an immobile patient, discomfort and embarrassing feeling of transesophageal echocardiography.

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## Simultaneous percutaneous peripheral arterial intervention and transfemoral transcatheter aortic valve implantation in bilateral iliac artery occlusive disease

*Bilateral iliak arter darlığında eşzamanlı periferik perkütan arteriyal girişim ve transfemoral transkateter aort kapak implantasyonu*

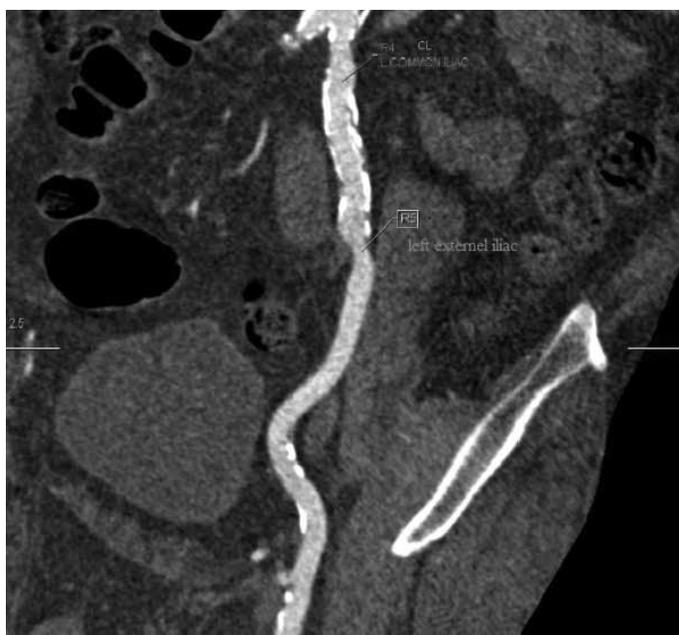
A patient with severe aortic valve stenosis and bilateral iliac artery occlusive disease was successfully treated by percutaneous balloon dilatation of the left common and external iliac arteries performed together with transfemoral transcatheter aortic valve implantation (TAVI). We therefore conclude that combined percutaneous peripheral

arterial intervention (PPAI) and transfemoral TAVI is feasible and can be associated with good clinical outcomes in selected cases.

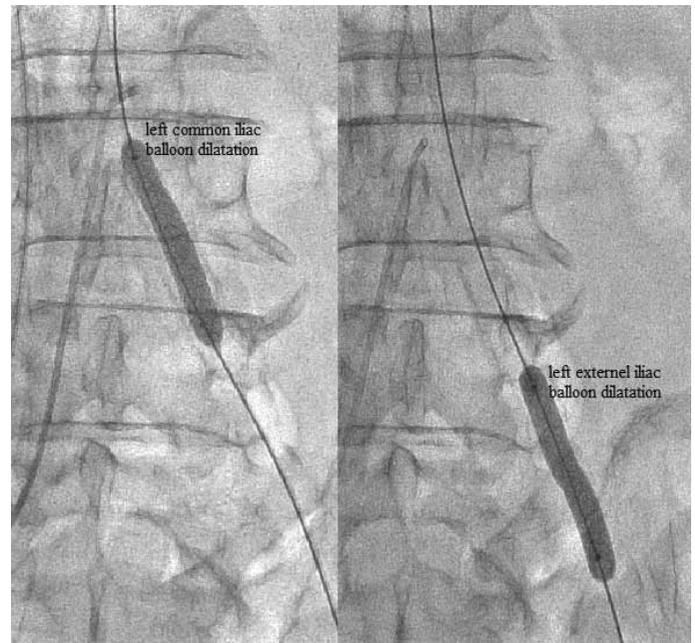
A 70-year-old male patient with a history of chronic obstructive lung disease (COPD), peripheral artery disease and coronary artery bypass grafting (CABG). On echocardiographic examination the patient had severe aortic stenosis with aortic valve area (AVA)=0.8 cm<sup>2</sup> and average transvalvular gradients of 44 mmHg. Also had mild-moderate mitral and mild tricuspid regurgitations with left ventricle ejection fraction of 50%. He had very high surgical risk (Logistic EuroSCORE=21.79%). He presented dyspnea New York Heart Association (NYHA) class III, not responding to full medical treatment. Multislice computerized tomography (MSCT) showed left common and external iliac arteries with narrowest diameters of 4.7 mm and 3.9 mm, respectively, and diffusely involved by plaques (Fig. 1). The right iliac artery was more diffusely calcified and tortuous. Peripheral angiography showed stenosis at the origin of the left common and external arteries. The intervention was initiated by a cut down on the left femoral artery, followed by dilatation of the left common and external iliac arteries with a 7x40 mm balloon (Fig. 2 and Video 1. See corresponding video/movie images at [www.anakarder.com](http://www.anakarder.com)). The 26 mm Edwards SAPIEN XT THV (Edwards Lifesciences, Irvine, California) passed through left femoral and left iliac arteries, located in the aortic valve level and after being placed in the suitable position, was opened optimally. Fluoroscopy was completed without any complication. Mild aortic regurgitation was seen on the aortogram (Fig. 3), and no abnormality was seen on the peripheral angiogram (Fig. 4). A peripheral stent was not needed, as there was neither arterial dissection nor severe stenosis post-operatively. The whole fluoroscopy duration was 30 minutes with a total of 280 mL of contrast material used. Thirty-day follow-up echocardiography revealed a well-functioning prosthetic aortic valve with an estimated valve area of 2.2 cm<sup>2</sup> and a mean gradient of 7 mmHg. Functional capacity of the patient improved to class 1 on the fourth month follow up.

The presence of a peripheral artery disease in our patient was an example of an important co-morbidity, which could have a significant impact on the outcome of TAVI, if not managed appropriately. Peripheral access via the femoral and iliac artery is an important issue, limiting

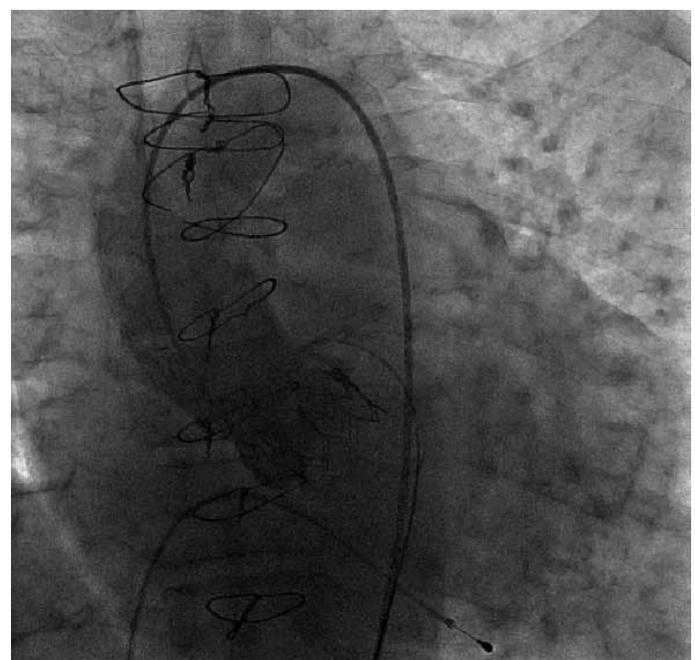
this technique's applicability in patients suffering from peripheral arterial disease. MSCT reliably identifies patients with suitable peripheral access. The frequency of peripheral arterial disease in patients treated with TAVI is reported as being 30.3% (1). Among the 25 cases treated in our Center, this frequency was 48%. A transapical approach was not considered in the reported patient because he was not a good candidate for general anesthesia due to advanced COPD. The selection of the TAVI valve and the approach is based on size, calcification and tortuosity of the femoral and iliac arteries, the calcification of the aortic arch and size of the annulus. For patients with unsuitable femoral access, alternatives include the apical, subclavian (2), open iliac or ascending aorta (3) approaches. Ideally the lumen diameter should



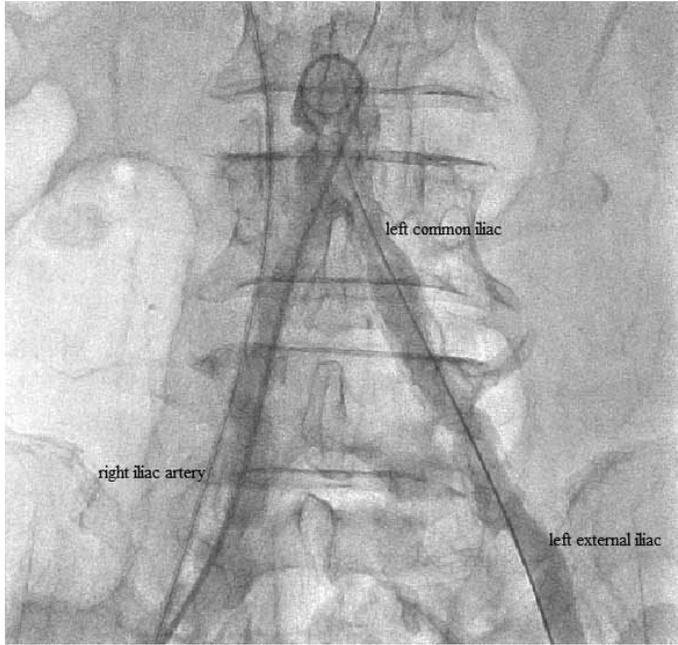
**Figure 1. Multislice CT image of the left common and left external iliac artery**  
CT - computerized tomography



**Figure 2. Balloon dilatation of the left common and external iliac arteries at their origin**



**Figure 3. Post-procedure image of the aortic root**



**Figure 4. Post-procedure peripheral angiogram**

exceed the diameter of delivery system, a femoral and iliac artery diameter of 6 mm or larger is required for a procedure using the transfemoral approach. Newer low-profile systems (e.g CoreValve and Edwards NovaFlex) are compatible with smaller 18 Fr sheaths. It is reasonable to assume that the risk of vascular complications is reduced with the use of these lower-profile delivery systems (4). Concomitant peripheral artery disease also increases the procedural risk of TAVI, and hence, a combined strategy for treating both entities needs to be carefully considered.

TAVI can be successfully performed by the transfemoral approach together with PPAI in cases in which general anesthesia for transapical implantation of an Edwards SAPIEN valve is not desired, in conditions

without surgical backup, or in patients who have a subclavian artery diameter of inappropriate for the introduction of a CoreValve device. Further data and experience are needed to evaluate this strategy.

**Video 1.** Balloon dilatation of the left common iliac artery.

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