Transcatheter Aortic Valve Implantation During Cardiopulmonary Resuscitation: Case Report

Kardiyopulmoner Resüsitasyon Altında Transkateter Aort Kapak İmplantasyonu

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For the video/videos of the article:

ABSTRACT Transcatheter aortic valve implantation (TAVI) is an effective alternative treatment method in patients with severe symptomatic aortic stenosis who are under high risk for surgery. A 79-year-old high-risk patient in terms of TAVI, arrested several times during the process. The 23 mm Edwards SAPIENT XT valve was placed to the aortic annulus during CPR with the guidance of TEE and aortic root angiography. TAVI procedure was completed successfully.

Key Words: Cardiopulmonary resuscitation; aortic valve stenosis

ÖZET Cerrahi açıdan yüksek riskli, semptomatik ciddi aort darlığı hastalarında transkateter aort kapak implantasyonu (TAVI), etkili, alternatif bir tedavi yöntemidir. 79 yaşında TAVI açısından da yüksek riskli olan olgumuz işlem esnasında defalarca kardiyak arrest oldu. CPR altında 23 mm Edwards SAPIENT XT kapak TEE ve aort kökü anjiyografisi kılavuzluğunda uygun pozisyonda aortik anulusa yerleştirildi. TAVI işlemini başarılı şekilde tamamlayabildik.

Anahtar Kelimeler: Kardiyopulmoner resusitasyon; kapak stenozu

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Transcatheter aortic valve implantation (TAVI) is an effective alternative treatment method in patients with severe symptomatic aortic stenosis who are under high risk for surgery.[1,2] TAVI procedure is an intervention with higher complication risks in patients with coronary artery disease, especially in whose hemodynamic parameters are impaired or, who have severe comorbidities and associated heart failure. Cardiac arrest is the most serious complication that can develop during TAVI, is a special case which must be intervened quickly and very carefully.

CASE REPORT

A 79 year-old female patient diagnosed with coronary artery disease, atrial fibrillation, chronic renal failure, thrombocytopenia and familial mediterranean fever admitted to our clinic with shortness of breath, weakness, and hypotension with New York Heart Association (NYHA) class 3 symptoms. The patient's neurologic examination was normal and ejection fraction (EF) was 30%. Severe calcific aortic stenosis (gradients 77/50 mmHg, aortic valve

area of 0.8 cm²), mild aortic regurgitation and moderate mitral regurgitation were detected on echocardiography. Aortic annulus diameter was measured as 20 mm (Video 1). Left anterior descending (LAD) stents were open and non-critical stenosis were present in coronary angiography. Circumflex (Cx) and right coronary artery (RCA) were observed with plaque. The patient whose aorta, iliac and femoral angiograms did not reveal stenosis had a The Society of Thoracic Surgeons (STS) score of 13.5. Trans-femoral TAVI decision was made by heart initiative.

A 16F sheath was placed after the right common femoral artery was explored surgically under general anesthesia. Temporary pacemaker electrode was placed in right ventricular apex through left femoral vein. Pressure monitoring and aortic injections were performed through left femoral artery. Then, while the aortic valve was dilated with 20x40 mm balloon dilatator under 180 beats per minute pacing, balloon was slid into LV. In the meantime, hypotension, bradycardia, and cardiac arrest were developed. Shortly after the chest massage was started, spontaneous heart rates were detected. Dilatation was made for the second time with the same balloon (Video 2). The patient had cardiac arrest again (Video 3). The 23 mm Edwards SAPIENT XT valve was placed to the aortic annulus during cardiopulmonary resuscitation (CPR) with the guidance of transesophageal echocardiography (TEE) and aortic root angiography (Video 4). Chest compressions were continued (Video 5), noradrenalin infusion was initiated. Spontaneous cardiac beats were observed after 12 minutes of CPR and patient's hemodynamics parameters recovered (Video 6). The procedure was terminated after the valve was evaluated with TEE and aortic root angiography and pressure measurements. In the echocardiography following the procedure, aortic velocity was 1.7 m/sec, moderate aortic regurgitation was observed. The rhythm was still in atrial fibrillation. The patient was discharged after 7 days of follow up in cardiology clinic with normal neurological examination. The patient is still being followed as compensated heart failure and her effort capacity is NYHA class 1-2.

DISCUSSION

In coronary artery disease patients with serious comorbidity and impaired hemodynamics, serious arrhythmias and asystole may develop during TAVI procedure due to impairment of coronary perfusion.[3] End diastolic pressure is high in heart failure patients with severe aortic stenosis. Coronary perfusion pressure is low in patients with low systolic blood pressure. Coronary perfusion ceases in TAVI procedure while the balloon is inflated on valve. Risky patients cannot tolerate this short duration of interruption of coronary perfusion. During this period, continuation of coronary perfusion by chest compressions is of vital importance. We performed chest compression manually in our case. However, devices which compresses chest automatically have been developed.[4]

Severe deformities of prosthetic valves have been reported in literature due to chest compression performed during TAVI.[5,6] Chest compression performed without deforming the prosthetic valve and providing adequate blood circulation to coronaries are well resulted in our case. There were no ischemic electrocardiographic changes or significant elevation of cardiac markers in our case. Since systolic blood pressure levels of our patient were around 80 mmHg, we concluded that having performed the chest compression holding the invasive blood pressure of the patient around 80 mmHg is the most important reason that the metal skeleton of the prosthetic valve was not deformed.

CONCLUSION

TAVI procedure is a very specific intervention that each phase should be carried out by a specialized cardio team. A good management and coordination of the team is essential. Chest compression performed during CPR is a featured procedure. Chest compression at a level that provides a sufficient coronary perfusion pressure but that does not deform the prosthetic valve skeleton is important.

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