Combined Percutaneous Aortic Valve Replacement and Unprotected Left Main Stenting in a Patients with Multiple Comorbidities;Stepwise Approach

Çoklu Komorbiditesi Olan Bir Hastada Perkütan Aortik Kapak Replasmanı ve Korumasız Sol Ana Koroner Stent İmplantasyonu;Basamaklı Yaklaşım

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Abstract

With increasing life expectancy, the prevalence of aortic stenosis (AS) also increases. Surgical aortic valve replacement (s-AVR) is performed with lower operative mortality in the absence of serious co-morbid conditions with both a recovery in symptoms and prolonged life expectancy. Nonetheless, 30% of patients cannot undergo AVR due to left ventricular dysfunction, advanced age and co-morbid conditions.

In addition, coronary artery disease has a high prevalence in these patients and shares many of the same causative factors. Herein, we report a patient who underwent both left main artery stenting and transcatheter aortic valve replacement in whom remarkable improvement observed after these procedures.

Keywords Transcatheter aortic valve replacement; Coronary Artery Stenoses: Aortic valve stenosis.

Öz

Yaşam beklentisi arttıkça, aort darlığı (AD) prevalansı da artar. Cerrahi aort kapak replasmanı (c-AVR), ciddi ko-morbid durumların yokluğunda düşük operatif mortalite ile gerçekleştirilir ve hem semptomlarda düzelme hem de survey katkısı sağlamaktadır. Bununla birlikte, hastaların % 30'unda sol ventrikül disfonksiyonu, ileri yaş ve eşlik eden hastalıklar nedeniyle AVR uygulanamaz. Ayrıca, bu hastalarda koroner arter hastalığı yüksek prevalansa sahiptir ve aynı nedensel faktörlerin çoğunu paylaşmaktadır. Bu vaka sunumumuzda basamaklı yaklaşımla sol ana arter stentleme ve transkateter aort kapak replasmanı yapılması sonrası dramatik iyileşme görülen bir hastayı sunuyoruz.

Anahtar kelimeler *Transkateter aort kapağının değiştirilmesi; Koroner Arter Darlıkları: Aort kapak stenozu.*

INTRODUCTION

Transcatheter aortic valve implantation (TAVI) has moved into the cardiology mainstream with rapid acceptance of this new technology since the first implant in 2002.[1] The two devices with the largest experiences are the self-expanding CoreValve Revalving™ system (Medtronic CoreValve, Luxembourg) and the balloon expandable Edwards Sapien XT valve (Edwards Lifesciences, Irvine, CA). Both are employed in patients whose peri-operative risk is deemed too high for surgical aortic valve replacement (sAVR). Coronary artery disease has a high prevalence in these patients and shares many of the same causative factors.[2,3]

The incidence of co-existing severe aortic stenosis (AS) and left main coronary artery (LMCA) disease is unknown, but is believed to be rising and presents a tremendous challenge to patients and clinicians.[3] If the patient is a poor surgical candidate due to multiple comorbidities, the remaining options are primarily palliative in nature.

In addition to these, renal functions are generally impaired in these patients due to advanced renal reserve and renovascular atherosclerosis, decreased renal perfusion depending on AS and the use of diuretics. Therefore, these patients are prone to cardio-renal syndrome (CRS). In this case, we report a patient who underwent LMCA stenting and transcatheter valve implantation. Although acute kidney injury occurred after coronary intervention on account of cardio-renal syndrome, noteworthy progression observed in terms of functional capacity and renal functions after procedure.

CASE REPORT

A 68 year old female patient with a history of coronary artery disease, atrial fibrillation, hypertension, ischemic stroke, severe aortic stenosis and congestive heart failure, was admitted to our hospital. She presented to the cardiology clinic with complaints of exercise induced angina and dsypnea. According to information from her family members, shortness of started a year ago, but has progressed rapidly in the last few months. Although, she had been hospitalized several times due to same symptoms, her medical condition was worsened by the day.

On admisssion, her cardiovascular system examination revealed 4/6 intensity systolic murmur at aortic focus and bilateral rales in two third lower bases of lungs accompanied by frothy and productive cough. Her neck veins were distended without carotid bruits. Abdominal examination revealed a palpable liver three centimeters below right costal margin, hepatojugular reflux was positive. There was a 3 positive pitting edema of lower extremities to the kness. Her nail beds minimaly cyanotic, and no clubbing was observed. Motor system examination revealed that muscle strength was 4/5 in left upper extremity and 3/5 in left lower extremity.

On physicial examination her blood pressure was 110/70 mmHg, heart rate 110 beats per minutes and oxygen saturation 92% on room air. Her laboratory tests revealed white blood cell 16.80 K/ul, hemoglobin 10.3 g/dL, hematocrit 30.4%, sodium 130 mMol/L, potassium 5.0 mMol/L, BUN 54 mg/dL, creatinine 1.78 mg/dL, Troponin T 7.6 pg/ml, CKMB 2.3 ng/ml, INR 1.96 IU. Medical tratment of patient consisted beta blocker, ace inhibitor, non-dihydropyridine calcium channel blocker, statin, and warfarin. Electrocardiogram (ECG) showed atrial fibrillation of 98 beats per minute. Echocardiography examination revealed segmental wall motion abnormalities with depressed ventricular function. Echocardiographic examination also showed severe aortic stenosis (mean aortic gradient:41 mm/hg, aortic valve area:0.41 cm2,) accompanied by mild mitral regurgitation and moderate tricuspit regurgitation. Systolic pulmonary artery pressure (sPAP) was 65 mm/hg and ejection fraction was calculated as %15-20 by Simpson' s rule. Where upon these results, we performed transesophageal echocardiography (TEE) and found a heavily calcified aortic valve with three leaflets, and severe aortic stenosis.

After administration of iv diuretics her symptoms improved and her vital signs came back to normal values. Soon after, we performed coronary angiography for further evaluation. Coronary angiography revealed crucial occlusions both in ostium of left anterior descending and circumflex arteries with distal left main coronary artery involvement (Figure1A).

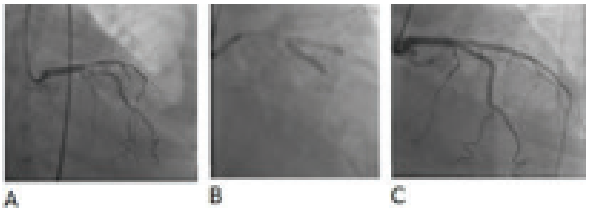

Figure 1A: *Coronary angiography from right anterior oblique projection: Severe stenosis both in ostium of left anterior descending and circumflex arteries.* ***Figure 1B:*** *Placement of stents in ostium of the left anterior descending and circumflex artery.* ***Figure 1C:*** *Final result*

Later, we discussed her condition with heart team which consisted of interventional cardiologist, anesthesiologist and cardiovascular surgeon. The STS score of the patients was 9.7, mean logistic EuroSCORE was 21.7%, and she was found to be in high risk group according to SURTAVI risk model. Due to her multiple comorbidities and prohibitive surgical risk percutaneous coronary intervention and transcatheter valve replacement was recommended.

After much deliberation between the patient and her family members, the patient elected to undergo percutaneous coronary intervention and transcatheter valve replacement. Afterwards, we deployed a 2.5*28 mm in size drug eluting stent to LAD mid segment. During same session 3.0*23 and 2.75*23 mm in size drug eluting stents extended to LAD ostial and circumflex artery ostial respectively (Figure 1B). V-stenting tecnique was choosen for left main coronary artery and than deployed succesfully (Figure 1C). After procedure she was monitored in coronary care unit. During her follow up her urine extraction decreased and contrast induced nephropathy occured. Due to impairment of renal function she was immediately transferred to coronary care unit and underwent temporary renal dialysis, Despite of all our attempts, we couldn't stabilize her vitals and urgent transcatheter valve replacement was considered to be needed. Four days after the first procedure 26 mm Edwards Sapien XT Transcatheter Heart Valve (Edwards Lifesciences Corporation; Irvine, Calif) valve deployed to aortic position without any complication (Figure 2). After the procedure she was monitored in coronary care unit and her urine extraction increased and vital signs returned to normal values. Two days after procedure she was transferred to cardiology clinic. Her temporary renal dialysis catheter was removed and control echocardiography performed. Her echocardiographic examination showed functional bioprosthesis in aortic position with mean pressure gradient 7 mm/hg. No paravalvuler leak observed and ejection fraction was calculated as %35 (2D) by Simpson's formula. She was discharged from the hospital eleven days after first admission.

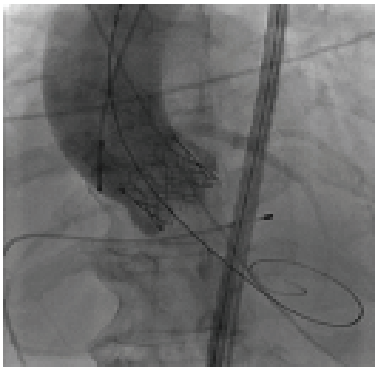

Figure 2: 26 mm Edwards Sapien XT valve deployed to aortic position.

DISCUSSION

Transcatheter aortic valve implantation (TAVI) has moved into the cardiology mainstream with rapid acceptance of this new technology since the first implant in 2002.[1] The two devices with the largest experiences are the self-expanding CoreValve Revalving™ system (Medtronic CoreValve, Luxembourg) and the balloon expandable Edwards Sapien XT valve. Both are employed in patients whose

peri-operative risk is deemed too high for surgical aortic valve replacement (sAVR). Coronary artery disease has a high prevalence in these patients and shares many of the same causative factors.[2,3]

The incidence of co-existing severe AS and LMCA disease is unknown, but is believed to be rising and presents a tremendous challenge to patients and clinicians.[4] If the patient is a poor surgical candidate due to multiple comorbidities, the remaining options are primarily palliative in nature.

LMCA stenting is a viable option in inoperable candidates and is associated with high rates of technical success, low procedural risk, and low rates of cardiac death (11.9%) at 3 year follow-up.[5]

Patients with symptomatic co-existing severe coronary artery disease, severe AS, and heart failure are frequently deemed to be poor surgical candidates, but these high-risk patients have percutaneous options. Ayhan et al showed that TAVI could be performed successfully in patient with AS and reduced ejection fraction(EF).[6] Also they reported that TAVI improves left ventricular function in the short and moderate periods. Similarly in our patient EF was improved from %25 to %35 but this effect could be attributed both TAVI and coronary revascularization.

Among the possible advantages of revascularization prior to TAVI may be a protective effect against the ischemic burden of the procedure, including as it does periods of hypotension. The absence of contractile reserve is associated with increased mortality after sAVR, and significant stenosis not intervened upon could contribute to this.[7] Surgical revascularization for multi-vessel coronary artery disease has been found to be an independent factor predictive of improvement of left ventricular ejection fraction (LVEF) after sAVR, and similar benefits for revascularization by percutaneous coronary intervention may exist. Improving coronary flow in symptomatic patients with significant flow-limiting stenoses may maximize this beyond the valvular intervention.[8]

In addition, renal functions are generally impaired in these patients due to advanced renal reserve and renovascular atherosclerosis, decreased renal perfusion depending on AS and the use of diuretics. Therefore, these patients are prone to cardio-renal syndrome (CRS). CRS occurs when acute or chronic heart, or kidney, disorder affects the other organ hemodynamically and neurohormonally. Type 2 CRS is characterized with the progressive renal dysfunction caused by cardiac dysfunction. Severe AS and low cardiac output and the decrease in renal perfusion activate the renin-angiotensin-aldosterone system and cause systemic inflammation, increased sympathetic activation, reduction of nitric oxide, endothelial dysfunction, tissue hypoperfusion and renal parenchymal fibrosis.[9]

In our case in whom we preferred step by step management because of co-existing severe coronary artery disease, severe aortic stenosis and heart failure. Although acute kidney injury occured on account of above-mentioned conditions,remarkable improvement observed after percutaneous valve implantation. Keles and his collegues reported that improving AS stops cardio-renal syndrome and provides progression in renal functions.[10]

In conclusion, combined transcatheter valve replacement and LMCA stenting is a viable option in patients who are deemed to be poor surgical candidates due to multiple comorbidites. While AVR and coronary artery bypass grafting remain the superior option, it is reasonable to offer these high-risk patients a combined percutaneous procedure for symptomatic relief.

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Conflict of Interest

There is no conflict of interest between the authors.

Informed Consent

Consent was obtained from the patient.

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