doi:10.30934/kusbed.792989 **e-ISSN:** 2149-8571

Kocaeli Üniversitesi Sağlık Bilimleri Dergisi

Olgu Sunumu / Case Report

http://dergipark.gov.tr/kusbed

TWO STAGED SURGICAL TREATMENT OF AORTIC COARCTATION ACCOMPANIED BY AORTIC STENOSIS IN A 63-YEAR-OLD PATIENT

63 YAŞINDAKİ HASTADA AORT STENOZUNUN EŞLİK ETTİĞİ AORT KOARKTASYONUNUN İKİ AŞAMALI CERRAHİ TEDAVİSİ

Özgür Altınbaş[1*], İlker Mercan[2], Volkan Burak Taban[3], Ömer Tanyeli[3], Erdal Ege[3]

[1]Gaziantep University, Vocational School of Health Services, Gaziantep, Turkey; [2]Tepecik Training And Research Hospital, Cardiovascular Surgery, İzmir, Turkey; [3]Necmettin Erbakan University, Meram Medical Faculty, Cardiovascular Surgery, Konya, Turkey

ORCID iD: Özgür Altınbaş:0000-0002-6819-2454; İlker Mercan: 0000-0002-0295-2641; Volkan Burak Taban: 0000-0002-0865-1356; Ömer Tanyeli: 0000-0001-6275-7744; Erdal Ege: 0000-0002-2763-6223

***Sorumlu Yazar / Corresponding Author:** Özgür Altınbaş, **e-posta / e-mail:** ozgur_altinbas@yahoo.com

Geliş Tarihi / Received:11.09.2020 **Kabul Tarihi / Accepted:** 05.04.2021 **Yayım Tarihi / Published:** 29.05.2021

Abstract

Aortic coarctation is a congenital vascular lesion, usually diagnosed and corrected in childhood or early adulthood. Most of the untreated patients with aortic coarctation die before the age of 50 years. Coarctation with cardiac lesions is a complex clinical situation that necessitates surgical treatment of different pathologies with different strategies.
In this, study we report two-staged surgical treatment of aortic coarctation with severe aortic stenosis consist of aortic valve replacement and aorto-subclavian bypass in a 63-year-old male patient.

Keywords:*Aortic coarctation, Aortic valve replacement, Congenital heart disease*

Öz

Aort koarktasyonu genellikle çocuklukta ve ergenliğin erken dönemlerinde teşhis edilen ve düzeltilen konjenitalvasküler bir lezyondur. Aort koarktasyonu olan ve tedavi edilmeyen hastaların çoğu 50 yaşından önce ölür. Koarktasyonun, kardiyak lezyonlarla birliktelik gösterdiği durumlar, farklı patolojilerin farklı stratejilerle cerrahi tedavisini gerektiren karmaşık bir klinik durumdur.
Bu çalışmada 63 yaşındaki erkek hastada ciddi aort stenozunun eşlik ettiği aort koarktasyonunun, aort kapak replasmanı ve aorto-subklaviyan baypastan oluşan iki aşamalı cerrahi tedavisini sunduk.

Anahtar Kelimeler:*Aort koarktasyonu, Aort kapak replasmanı, Konjenital kalp hastalığı*

Introduction

Coarctation of the aorta is the narrowing of the thoracic aorta distal to the left subclavian artery and one of the most common congenital heart diseases with an incidence of 5-10%.[1] It is usually accompanied by other cardiac pathologies such as mitral valve stenosis, bicuspid aortic valve, subvalvular, valvular, or supravalvular aortic stenosis, or complex congenital heart defects. The mean survey is 34 years and the mortality rate up to 80% before the fifth decade if left untreated.[2]

Treatment modalities are surgery, balloon angioplasty and endovascular stenting.[3]Beside this, coarctation of the aorta with cardiac lesions is a major clinical challenge thus the pathology exists in two separate anatomical locations. Especially in adults aneurismal changes or calcification of the lesion and risk of massive hemorrhage due to expanded collateral arteries increase its surgical difficulty. So the lesion that should be corrected first and the type and the timing of the procedure has vital importance to avoid from morbidity and mortality.[4,5]

In this report we present the two-staged surgical treatment of a 63-year-old male patient with aortic coarctation accompanied by aortic stenosis, initially aortic valve replacement than correction of coarctation to protect left ventricle due to a sudden decrease of afterload and to enable myocardial and coronary flow redistribution.

Case Report

A 63-year-old male patient was admitted to our department with the complaint of uncontrolled hypertension, dyspnea and fatigue. His medical history revealed resistant, long-standing hypertension. The patient was first diagnosed with hypertension nearly twenty years ago and an angiotensin converting enzyme inhibitor was started as initial therapy. Although different anti-hypertensive treatment modalities had been used, his arterial blood pressure could not be controlled since the first diagnoses. Physical examination revealed 200/120 mmHg arterial blood pressure in his upper extremities and 90/60 mmHg in lower extremities. There was no difference between the upper extremities in the subject of arterial blood pressure measurements. Femoral pulses were diminished. Mid-systolic ejection murmur over the right second inter-costal space with radiation into the neck was heard via auscultation. Electrocardiographic analysis showed left ventricular hypertrophy. Transthoracic echocardiography revealed a 75 mmHg peak gradient and 0.7 cm^2 surface area in the aortic valve. The left ventricular ejection fraction was 55%. Before the management of the aortic stenosis a coronary angiogram was performed. There was no significant luminal coronary disease but coarctation of descending aorta was detected in aortography. The gradient was measured 70 mmHg between the ascending aorta and descending aorta. To determine the structure of the coarctation computerized tomography angiography was performed and an image compatible with preductal type, severe aortic coarctation distal to the left subclavian artery was obtained (Figure 1). After informed consent two-staged surgical treatment was planned for the patient. First, aortic valve replacement with 22 no mechanical valve was performed via median sternotomy with a two-staged aortic cannula (femoral and ascending aorta) because we aimed to supply blood flow distal part of the coarctation. Six weeks after this operation coarctation was corrected with aorto-subclavian bypass by using an 18 mm Dacron graft via left thoracotomy (Figure 2). The patient was discharged on postoperative eighth and sixth days, respectively. He was uneventful in the two-year follow-up period.

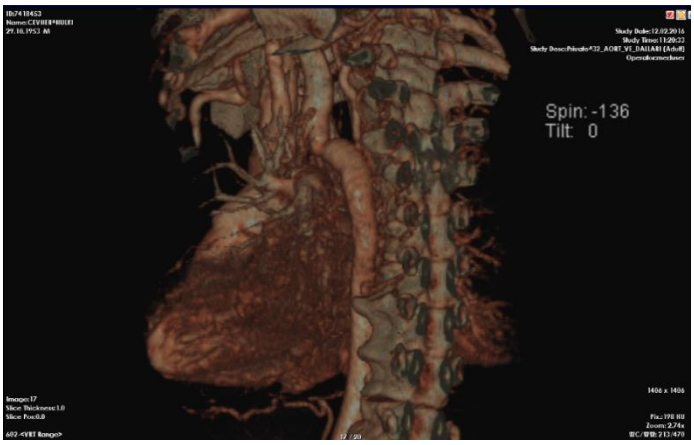

Figure 1. Aortic coarctation in preoperative CT angiography image

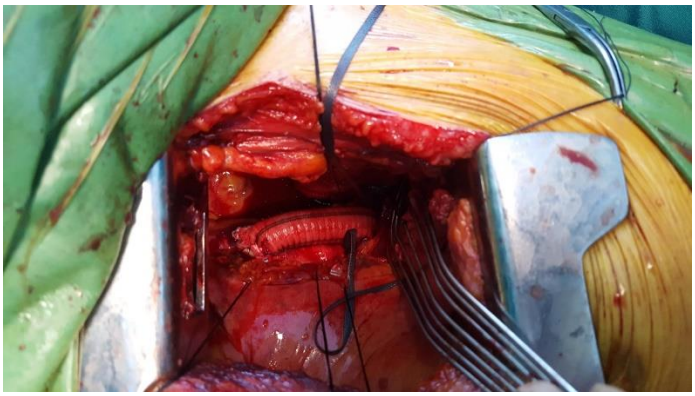

Figure 2. Intraoperative image of aorto-subclavian bypass with Dacron graft

Discussion

Although aortic coarctation is generally diagnosed and corrected in early childhood, it is frequently diagnosed in adulthood because some patients can remain symptom-free for several years.[6] Only 5% of the patients die older than 60 years.[7] Major causes of death in these patients are usually secondary to heart failure, coronary artery disease, infective endocarditis, aortic rupture/dissection, concomitant aortic valve disease or cerebral hemorrhage.8 Coarctation of the aorta increases the left ventricular afterload and leads to compensatory hypertrophy, left ventricular systolic dysfunction and formation of collateral pathways via the intercostal arteries. Adult type coarctation is usually associated with hypertension and may be diagnosed incidentally when investigated for systemic hypertension.[2] There are evidences in the literature that surgical repair of the aortic coarctation in patients after 20 years old, reduces the systolic hypertension.[9]

Treatment strategies of aortic coarctation and the accompanying cardiac anomalies include surgery, balloon angioplasty and endovascular stenting.[4]Since the first coarctation repair operation was in 1944, the optimum surgical approach and the timing of the surgery remain controversial. Additionally, in cases with cardiac defects, there is a discussion on the subject of the lesion which should be corrected first.[5] Severe coarctation of aorta with intra-cardiac pathology such as severe valvular stenosis or regurgitation and/or coronary artery disease in elderly patients requires surgery.[8] Surgical approaches include

single-stage and two-stage operations. One-stage aortic valve repair and consequent repair for aortic coarctation are related with heart failure and life-threatening ventricular arrhythmias. Global myocardial ischemia and impaired coronary blood supply in hypertrophied hearts with low perfusion are responsible for this situation. Furthermore, the organ systems distal to the stenotic region exposed to hypoperfusion. Similarly, bleeding and hemodynamic instability, coagulation and renal disorders and hypertensive complications may occur in that patients.[10] Additionally, increased postoperative pain and atelectasis due to simultaneous thoracotomy and sternotomy in the single-stage procedure are clinical issues to cope.[4]

Aortic valve stenosis and coarctation of the aorta cause two forms of pressure; increased afterload on the left ventricle due to stenotic valves and increased backward pressure due to narrowed aortic part.[11] If the coarctation is repaired first myocardial blood flow substantially reduces due to acute decrease in systemic vascular resistance. This leads to acute myocardial hypoperfusion. The sudden drop in systemic vascular resistance during diastole in the hypertrophied ventricle of aortic stenosis results in myocardial ischemia. Two-stage repair also maintains the recovery of the myocardium and redistribution of the coronary blood flow during the period between the two operations.[12] Effective collateral circulation around the obstructed aortic segment was revealed in several studies which minimalize the intraoperative bleeding.[13] Decreasing in the myocardial and cerebral blood flow in one-stage operation due to simultaneous intervention to the both stenosis, can be avoided in two-stage operation.[14] In patients coarctation with aortic stenosis, it will be better to perform the first intervention for aortic stenosis. The operation that is oriented to coarctation could be performed 6-8 weeks after the initial process. Thus, the perfusion of left ventricle due to sudden decrease of afterload will not be affected.

In conclusion, time and the type of the operation for coarctation of aorta with intracardiac pathologies should be planned accurately to prevent postoperative complications.

Conflict of Interest

The authors declare no conflict of interest.

Financial Support

The authors declare no financial support given by anybody or corporation.

Author Contributions

ÖA, EE: Design; ÖA, İM, VBT, ÖT, EE: Project development; ÖA, VBT, ÖT: Data collection ÖA, İM, VBT, ÖT, EE: Analysis; ÖA, EE: Literature search;ÖA, EE, İM, VBT, ÖT: Manuscript writing; ÖA, İM, VBT, ÖT, EE: Critical review

References

1. Holzer R, Quershi S, Ghasemi A, Vincent J, Sievert H, Gruenstein D, et al. Stenting of aortic coarctation: Acute, intermediate, and long-term results of a prospective muti-institutional registry- Congenital cardiovascular interventional study consortium (CCISC). *Catheter Cardiovasc Interv*. 2010; 76(4): 553-563. doi:10.1002/ccd.22587
2. Duran NE, Korkmaz Y, Kurt FB, Yilmazer SM, Cingozbay BY. AortCoarctation. *Maltepe Med J*. 2014; 6(3): 1-5.
3. Yu Z, Wu S, Li C, Zou Y, Ma L. One stage surgical treatment of aortic valve disease and aortic coarctation with aortic bypass grafting through the diaphragm and aortic valve replacement. *J Cardiothorac Surg*. 2015; 10: 160-167. doi:10.1186/s13019-015-0338-2
4. Ugur M, Alp I, Arslan G, Temizkan V, Ucak A, Yilmaz AT. Four different strategies for repair of aortic coarctation accompanied by cardiac lesions. *Interact CardiovascThorac Surg*. 2013; 17(3): 467-471. doi:10.1093/icvts/ivt242
5. Koletsis E, Ekonomidis S, Panagopoulos N, Tsaousis G, Crockett J, Panagiotou M. Two stage hybrid approach for complex aortic coarctation repair. *J Cardiothorac Surg*. 2009; 4: 10-18. doi:10.1186/1749-8090-4-10
6. Alvarez JR, Lopez LR, Quiroga JS, Comendador JM, Alegria A, Cereijo JM, Dominguez CD. Internal mammary artery dilatation in a patient with aortic coarctation, aortic stenosis, and coronary disease: Case report. *J Cardiothorac Surg*. 2011; 6: 55-62. doi:10.1186/1749-8090-6-55
7. Campbell M. Natural history of coarctation of the aorta. *Br Heart J*. 1970;32:633-640. doi:10.1136/hrt.52.5.633
8. Park JH, Chun KJ, Song SG, Kim JS, Park YH, Kim J, et al. Severe Aortic Coarctation in a 75-Year-Old Woman: Total Simultaneous Repair of Aortic Coarctation and Severe Aortic Stenosis. *Korean Circ J*. 2012; 42(1): 62-64. doi:10.4070/kcj.2012.42.1.62
9. Refatllari A, Likaj E, Dumani S. Prosthetic Subclavian-Aortic Bypass as a Safe Surgical Technique for the Coarctation of the Aorta in Adults. *Macedonian Journal of Medical Sciences*. 2016; 4(1): 47-49. doi:10.3889/oamjms.2016.006
10. Brouwer RM, Erasmus ME, Ebels T, Eijelaar A. Influence of age on survival, late hypertension and recoarctation in elective aortic coarctation repair. *J ThoracCardiovasc Surg*. 1994; 108: 525-531. PMID:8078345
11. Jashari H, Rydberg A, Ibrahimi P, Bajraktari G, Henein MY. Left ventricular response to afterload in children; Aortic stenosis and coarctation: A systematic review of the current evidence. *Int J Cardiol*. 2015; 198: 203-209. doi:10.1016/j.ijcard.2014.10.089
12. Mulay AV, Ashraf S, Watterson KG. Two-stage repair of adult coarctation of the aorta with congenital valvular lesions. *Ann Thorac Surg*. 1997; 64: 1309-11. doi:10.1016/s0003-4975(97)00814-X
13. Singh S, Hakim FA, Sharma A, Roy R, Panse PM, Chandrasekaran K, et al. Hypoplasia, Pseudocoarctation and Coarctation of the Aorta- ASystematic Review. *Heart, Lung and Circulation*. 2015;24(2):110-118. doi:10.1016/j.hcl.2014.08.006
14. McLennan D, Caputo M, Talitolis D. Severe Aortic Stenosis and Severe Coarctation of the Aorta: A Hybrid Approach to Treatment. *Front Surg*. 2017;4:16-19. doi:10.3389/fsurg.2017.00016