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Repair of anomalous origin of right coronary artery in an adult patient using coronary artery implantation technique

Orhan Saim DEMİRTÜRK (*), Hüseyin Ali TÜNEL (*), İsa COŞKUN (*), Mediha Hacer ÜLGER (**), Abdullah TEKİN (***), Öner GÜLCAN (*)

ÖZET

Yetişkin hastada sağ koroner arter çıkış anomalisinin koroner arter implantasyon tekniği ile onarımı

Koroner arterlerin konjenital çıkış anomalileri nadir görülür. Ancak koroner arter özellikle çıkan aorta ile pulmoner arter arasında seyrettiğinde meydana gelen miyokard iskemisi sonucu klinik açıdan ölümcül sonuçlar ortaya çıkabilir. Genellikle belirti vermeden seyretmeleri, klinik kuşku uyanmadığı zaman fark edilmeden geçilebilmelerinin yanında rutin tarama testleri olan 12 derivasyonlu egzersiz testinde maksimal eforda bile bulgu ya da belirti vermeyebilmeleri bu zor hastalığı daha da önemli kılmaktadır. Biz bu olgu sunumumuzda kliniğimize efor anjinası ve nefes darlığı ile başvuran sağ koroner arter çıkış anomalisi saptanan 47 yaşındaki kadın hastamız ve koroner arter implantasyon tekniği ile yapılan cerrahi tedaviyi sunduk.

Anahtar Kelimeler: *Koroner arter çıkış anomalisi, koroner arter implantasyonu*

SUMMARY

Anomalous origin of coronary arteries is rarely seen. However when the coronary artery courses between the ascending aorta and the pulmonary artery leading to myocardial ischemia clinically fatal results may occur. The fact that they are usually symptom-free, and they may be missed when no clinical suspicion arises and moreover that they may even give no symptom or sign even under 12-lead exercise test with maximal exercise makes this difficult disesase important. In this case report we present a 47-year-old female patient diagnosed with anomalous origin of the right coronary artery who was admitted with effort angina and shortness of breath and the surgical correction performed using coronary artery implantation technique.

Key Words: *Anomalous origin of coronary artery, coronary artery implantation.*

Introduction

Sudden death due to myocardial ischemia may occur in patients with anomalous origin of coronary arteries with subsequent course between the great arteries (1). Although this congenital anomaly is usually clinically silent, it may present with sudden death after exercise (2). This entity has usually been reported in young competitive athletes (3). High rate of mortality related to the anomaly resulted in most papers reporting the entity as postmortem series (3, 4). Angelini reported general incidence of coronary artery anomalies as 5.64% and anomalous origin of coronary arteries as 1.07% (5). So 15-20% of all coronary artery anomalies are of the anomalous origin type. Angelini also denotes that the majority of anomalous origin of coronary arteries are right coronary artery anomalies (5). Approximately 1% of adults undergoing coronary angiography present with congenital coronary anomalies (6). We report a 47-year-old female patient with right coronary artery origin anomaly who was surgically treated using coronary artery implantation technique.

Case Report

A 47-year-old female patient applied to our clinic with the complaints of ongoing angina and dyspnea upon exertion for one and a half month duration. The patient had similar complaints four years earlier which had subsided in time. A treadmill test produced 3 mm downsloping ST segment depression and typical angina. Coronary angiogram revealed normal coronary arteries. Therefore the patient was diagnosed with cardiac syndrome X. Although medications alleviated her symptoms permitting an angina free four year period, she began experiencing effort angina again at the time of her current hospitalization. She had a history of diabetes mellitus, hypertension and smoking. Her echocardiogram was nondiagnostic. A new coronary angiogram was performed leading to the diagnosis of anomalous origin of the right coronary artery (Fig. 1). Cardiac tomography was helpful in demonstrating the impingement of the anomalous right coronary artery between the aortic and pulmonic trunks (Fig. 2). It was shown that the right coronary artery originated from the left sinus of valsalva and was exposed to pressure from the pulmonic trunk as it coursed between the great arteries along a segment of 1.5 cm causing 70% diffuse stenosis. An operation was planned to correct the patient's anomalous origin of the right coronary artery.

Standard median sternotomy and cannulation were performed and cardiopulmonary bypass (CPB) was initiated. Isothermic blood cardioplegia was used to arrest the heart. The ostium of the right coronary artery was originating from the left sinus of Valsalva with an osteal stenosis and was coursing between the aorta and the pulmonary artery. The right coronary artery distal to the pulmonary artery was dissected free

* Başkent University Adana Medical Center Department of Cardiovascular Surgery;
** Başkent University Adana Medical Center Department of Anesthesiology and Reanimation;
*** Başkent University Adana Medical Center Department of Cardiology;

Ayrı basım isteği: Orhan Saim DEMİRTÜRK
Başkent University Adana Medical Center
Department of Cardiovascular Surgery
e-mail: osdemirturk@yahoo.com

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and implanted to a new ostium created in the aorta with the help of a 3.5 mm routine proximal anastomosis punch using 7-0 polypropylene suture (Fig. 3). The stump left on the coronary artery adjacent to the pulmonary artery was ligatured over-and-over using 6-0 polypropylene. The patient was discharged on postoperative day 4 after an uneventful recovery. The patient is being followed symptom free by our cardiology and endocrinology departments in the postoperative 32nd month.

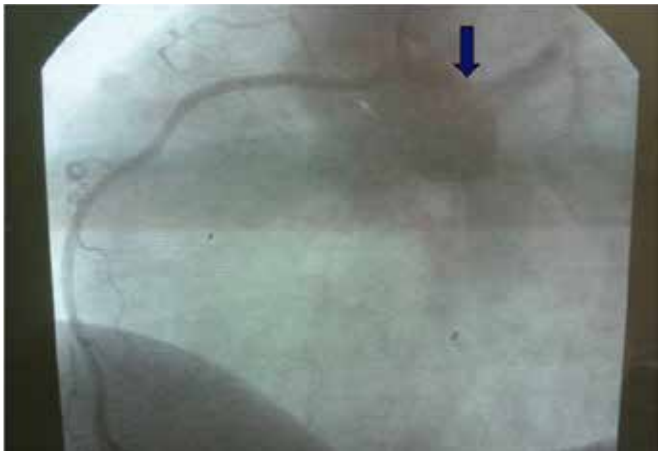

Figure 1: Angiographic image showing anomalous origin of the right coronary artery

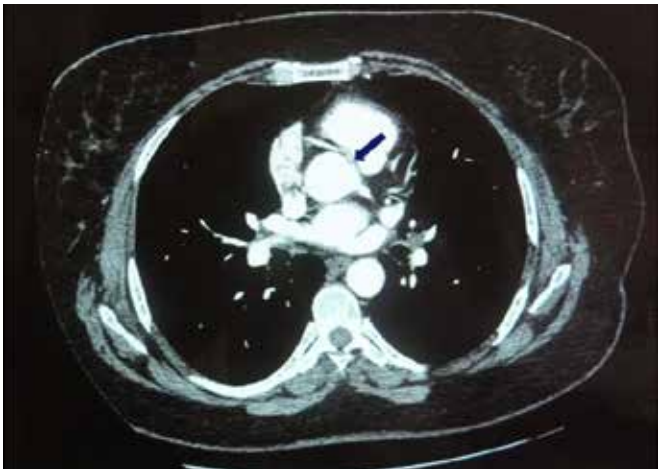

Figure 2: Computerized tomographic image demonstrating the impingement of the right coronary artery between the great arteries. Arrow points to the narrowing in the right coronary artery as it courses between the aorta and the pulmonary artery.

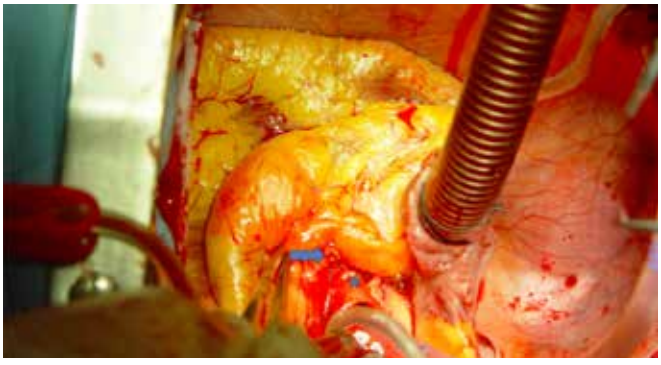

Figure 3: Photograph demonstarting implantation of the right coronary artery to the new ostium in the aorta. Arrow shows the right coronary artery button. Star shows the new ostium created in the aorta.

Discussion

Anomalous origin of coronary arteries were first reported as early as 1947 but their clinical significance have first been reported by Cheitlin in 1974 (4). The first necropsy series analysing the anomalous origin of the right coronary artery from the left sinus of valsalva was reported by Roberts in 1982 (7).

Coronary artery origin anomalies are usually symptom-free. Risk of mortality is high in asymptomatic patients, especially if they are young athletes participating in competitive sports. Symptomatic patients, such as ours, are fortunate because the most frequently encountered symptoms angina pectoris and dyspnea constitute a serious warning in opening way to investigations to illuminate the pathology. Prodromal symptoms in otherwise healthy and young patients are prone to be entirely missed. Many sudden deaths in sports fields enter this category (3).

Some patients might come with the initial diagnosis of cardiac syndrome X. Cardiac syndrome X has first been defined by Kemp et al in 1967 and gained the name Cardiac syndrome X later (8). Cardiac syndrome X represents a diagnostic enigma as the patients present with typical chest pain, electrocardiographic changes or positive treadmill test indicating myocardial ischemia in the presence of normal coronary arteriograms (9). It is true that some patients diagnosed as cardiac syndrome X may harbor anomalous origin of coronary arteries. Coronary angiograms in many patients like ours may be challenging to interpret and diagnosis may be missed as happened in the first coronary angiogram of our patient. If three-dimensional echocardiography, which is a new and noninvasive diagnostic modality, could be performed, the diagnosis could have been made earlierin our patient.

Anomalous origin of coronary arteries were regarded as innocent variations in the past, whereas currently, they represent the second most frequent cause of athletic fatality after hypertrophic cardiomyopathies and arrythmogenic right ventricular cardiomyopathies (2, 3). Treadmill test is usually nondiagnostic in these patients (3). The crucial point in the management of such a congenital pathology is identification. A clinical index of suspicion must come to the mind. It is even more difficult to diagnose as most patients with the defect do not have prodromal or clinical symptoms. Peliccia et al demonstrated that it is possible to obtain echocardiographic images of proximal portions of left and right coronary arteries in a reliable fashion in a large proportion (95%) of athletes (10). As the author declares it should be a common algorithm in mind to initiate further and invasive tests such as cardiac computed tomography or coronary angiogram in patients in whom angina or confusion of consciousness accompany echocardiographic evidence of failure to demonstrate that either the right or left coronary artery originates from the usual sinus (10). There are many reports of use of three-dimensional transthoracic and transesophageal echocardiography in cardiac diagnosis, such as in describing the relationship between subaortic membrane and aortic cusps and evaluation of unroofed coronary sinus on real time three-dimensional transesophageal echocardiography (11, 12). This modality is a promising new technique. It will be an indispensible tool as it improves in time.

Anomalous origin of coronary arteries is surgically correctable. Three main techniques have been applied until today. The first technique has been coronary bypass surgery to overcome the anatomic stenosis (3). The second is the so-called

unroofing technique (3). The third one is the reimplantation technique (1). A fourth but infrequently reported technique in the pediatric age group is the pulmonary artery translocation technique described by Rodefeld et al in complex anomalous coronary artery defects (13). Stent use in cases of right coronary artery originating from the left coronary sinus has limited success because it does not address the aberrant usually slit-like ostium or the oblique proximal course of the artery (2). But there are successful reports in the literature when the course of the artery permits use of stents (14).

The reimplantation technique is a good anatomical and physiological technique which aims to eliminate the narrow slit-like ostium. Risk of myocardial ischemia and infarction is eliminated by relieving the impingement of the great arteries on the coronary artery (1). Results of this technique are better than with the unroofing technique or the coronary bypass method (2). The unroofing technique necessitates detachment and re-suspension of the corresponding commissure which is technically more demanding, time consuming and may lead to unwanted late aortic valve insufficiency (2). Flow to the native coronary artery continues and risk of competition may ensue in the bypass method as the abnormal ostium stays intact. We did not prefer bypass as it is inherently a palliation. Therefore we chose the reimplantation technique as the method of correction. The clinical result is satisfactory.

Symptomatic patients with anomalous origin of coronary arteries should receive surgical treatment. Coronary arteriography or computed tomography are highly diagnostic. Three-dimensional echocardiography is a promising new diagnostic modality. Direct reimplantation technique in cases of anomalous origin of the right coronary artery is a reliable surgical treatment method.

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