Coronary-Subclavian Artery Steal Syndrome After Coronary Artery Bypass Grafting: A Case Report of Inadvertent Deficient Preoperative Evaluation

Koroner Bypass Cerrahisi Sonrası Koroner-Subklavyen Arter Çalma Sendromu: Yanlış ve Eksik Preoperatif Değerlendirme Sonucu Ortaya Çıkan Bir Olgunun Sunumu

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ABSTRACT A 46-year-old male patient was operated due to unstable angina pectoris, with the utilization of left internal thoracic artery to revascularize left anterior descending artery, in addition to free saphenous graft to obtuse marginal artery. On the second postoperative day, anginal complaints of the patient with acute ischemic ECG changes on anterior derivations suggested occlusion of left internal thoracic artery. Digital subtraction angiography revealed near total occlusion of left subclavian artery before the origin of internal thoracic artery. Since the interventional techniques to relieve the subclavian artery stenosis were unsuccessful, the patient was treated with carotid-subclavian bypass. On 6th postoperative month, the patient is free of symptoms, with normally functioning left ventricle.

Key Words: Internal mammary-coronary artery anastomosis, coronary artery bypass, subclavian steal syndrome

ÖZET Kararsız anjina pektoris nedeniyle opere edilen 46 yaşındaki erkek hastada, sol ön inen artere sol internal torasik arter ve obtus marjinal artere safen ven ile bypass yapıldı. Postoperatif 2. günde ön duvarı ilgilendiren akut iskemik EKG değişiklikleri ile birlikte anjinal şikayetleri ortaya çıkınca sol internal torasik arter tıkanıklığı düşünüldü. Yapılan dijital substraction anjiyografide sol subklavyen arterin internal torasik arter çıkışından önce hemen hemen tam tıkalı olduğu görüldü. Girişimsel yöntemlerle bu tıkanıklığın açılması denemelerinin başarısız olması üzerine, hastaya karotid-subklavyen bypass uygulandı. Postoperatif 6. ay kontrolünde hastanın herhangi bir şikayetinin olmadığı, sol ventrikül fonksiyonlarının normal olduğu görüldü..

Anahtar Kelimeler: Internal mammary-koroner arter anastomozu; koroner arter bypass; subklavyen çalma sendromu

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Coronary-subclavian artery steal syndrome (CSASS) is a rare entity that causes myocardial ischemia early after coronary artery bypass surgery (CABG), when insitu left internal thoracic artery (LITA) used as a bypass conduit. In a patient, who was operated emergently for severe left main coronary artery stenosis and non ST elevation myocardial infarction (NSTEMI), myocardial ischemia developed on postoperative second day due to CSASS and we performed a successful left carotid-subclavian artery bypass with an ePTFE graft.

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CASE REPORT

A 45-year-old male patient without diabetes mellitus, but with a positive family history was admitted to our hospital with the diagnosis of NSTEMI. Troponin- I levels were mildly elevated, and creatinin kinase MB (CK-MB) was normal. Immediate coronary angiography revealed 95% stenosis of left main coronary artery with subsequent narrowing to 80% at circumflex artery. Left ventricular performance seemed almost normal at ventriculographic images. Emergent operation was decided.

Left radial artery was cannulated for the monitorization. Systolic blood pressure was over 90 mmHg. After the standard sternotomy, pedinculated LITA was prepared with electrocautery, and saphenous vein was prepared with standard techniques. The LITA flow was not very satisfactory, but this was mis-thought to be due to arterial spasm. Under cardiopulmonary bypass, cross-clamp was applied and heart was arrested with isotermic (tepid) blood cardioplegia administered retrogradely via coronary sinus. Free saphenous vein to circumflex obtuse marginal artery and LITA to left anterior descending artery bypasses were performed. Patient left the operating room without any recordable event and was extubated on 6th postoperative hour.

On the second postoperative day, while the patient was fully mobile in the ward, he declared typical anginal pains. Electrocardiography showed 3mm ST segment elevations on anterior derivations. Troponin-I levels were still mildly elevated, and CK-MB levels were still in normal limits. On physical examination, we have discovered a systolic blood pressure difference between two arms which was not present in the preoperative records of the patient. Blood pressure of the right arm was 50mmHg higher compared to left arm. Remembering the non-satisfactory LITA flow at operation, an immediate digital subtraction angiography (DSA) to visualize the aortic arcus vessels was performed. On DSA, 99% stenosis of left subclavian artery was discovered. Also LITA could not be visualized (Figure 1). Radiologists tried to dilate the vessel, but the lesion could not be passed with guidewires. We decided to perform a carotid-subclavian artery bypass and transferred the patient to the operating room again. Under general anesthesia, with a supraclavicular incision, 8mm ePTFE graft was interposed between left common carotid and left subclavian artery. ST elevations on ECG returned to isoelectric level immediately after the operation. Carotid subclavian bypass graft was evaluated with Dupplex scanning on postoperative 2nd day. The graft was patent with perfect flow characteristics excluding further invasive diagnostic procedures such as DSA. After an uneventful recovery patient was discharged from hospital for home on 9th postoperative day. Blood pressure difference between the arms was diminished. On 4th postoperative month, echocardiographic examination revealed normal ventricular functions, and the patient was free of symptoms. His medication on the follow-up includes anticoagulation with warfarin sodium.

FIGURE 1: Selective left subclavian artery angiography of the patient. Tight stenosis of the artery can be seen. LITA graft could not be visualized.

DISCUSSION

LITA is the most commonly used arterial graft in CABG with superior long term patencies. Arterial grafts are prone to injury during preparation, or spasms may result with acute insufficiency of blood flow. Coronary-subclavian artery steal syndrome may be defined as the reversal of arterial flow

from coronary arterial bed to subclavian artery via LITA due to proximal stenosis or occlusion of subclavian artery, causing myocardial ischemia.[1] To our knowledge, CSASS was first described by Harjola in 1974.[2] Previously, the incidence of CSASS is reported to be between 0.5-2%,[3,4] but more recent articles suggest lower frequencies, changing between 0.1-0.2%.[5] Vasculitis, radiotherapy, iatrogenic traumas, congenital malformations and thoracic outlet syndromes may be the causes of subclavian artery stenosis, besides atherosclerosis.[6] Some articles emphasize the probability of secondary CSASS due to ipsilateral hemodialysis fistulae.[7] There isn't a consensus on the treatment of CSASS. Transthoracic and/or extrathoracic surgical procedures as well as the percutaneous interventions including balloon angioplasty and stenting were described previously.

Clinical findings of CSASS may vary; changing from being asymptomatic to sudden unexpected death, usually depending on the degree of subclavian artery stenosis. The most pathognomonic sign is the initiation of angina pectoris with exertion of the left arm. The signs of vertebro-basillary insufficiency may co-exist, as well as the ischemic picture of the involved arm. On physical examination, loss of peripheral pulses on the involved arm, murmurs at clavicular and servical regions, and blood pressure difference between two arms can be discovered. Even though some studies suggest angiographic evaluation of the left and right subclavian arteries in coronary artery bypass candidates, in general invasive evaluation methods should be preserved for patients with individual risk factors for subclavian artery stenosis, such as in the presence of carotid or other peripheral artery stenosis, patients with preoperative diagnosis of any kind of systemic vasculitis or ipsilateral arterio-venous fistulae.[8] Apart from this approach, in any case a coronary angiography is planned, complete examination of peripheral arterial pulses and measurements of blood pressure of all extremities must be done, without any excuse. The probability of subclavian artery stenosis or occlusion should never be underestimated. Multi-slice CT, ultrasonic duplex scanning and magnetic resonance angiographic examinations can be good alternatives for patients with the risk factors for subclavian artery stenosis.

There is not any consensus for the treatment options of CSASS. Angioplasty and stent applications can be performed with 90-95% technical and clinical success.[9] Surgical treatment has two alternatives. Transthoracic aorta-subclavian artery bypass seems to be the most valuable technique with very high success probability, but this option bears the complication risks related to resternotomy. Kırali et al reported 3 cases of preoperatively diagnosed subclavian stenoses, which were operated (aorto-subclavian bypass with saphenous vein grafts) concomitantly with coronary bypass operations.[10] This can be applied in cases with preoperatively diagnosed subclavian artery stenosis, in patients who are undergoing CABG, in order not to sacrifice insitu LITA utilization. Extra-thoracic extra-anatomic surgical revascularization methods are more frequently applied. These include subclavian-subclavian artery bypass, axillo-axillary bypass, subclavian artery transposition to carotid artery, but ipsilateral carotid-subclavian artery bypass is the most commonly used.[11] This method avoids resternotomy, can be performed with a small incision and have a very good long term patency. In patients with a prior history of ischemic cerebrovascular diseases or known carotid artery stenosis, this type of surgery may cause a perioperative cerebral tromboembolic event.

The problem we have met was due to insufficient history and physical examination and should not bear any apology. Even in the emergency cases, as it was in our patient, very simple measures could have avoided what we have done later. Our first choice to solve the problem was the percutaneous interventions, but the subclavian artery stenosis could not be passed antegradely or retrogradely. This obliged us to immediate surgical options. The proximal end of LITA graft could have been anostomosed to aorta directly in addition to carotid-subclavian bypass with resternotomy, but since the long term patency of free LITA grafts are not better than carotid-subclavian artery bypasses, rationale for

this approach is not convincing. Patency rates of free LITA grafts to coronary arteries are given to be between 77-100%.[12]

As a conclusion, we can emphasize the importance of good physical examination and patient history and the probability of subclavian artery stenosis or occlusion; even it is rare. On the other hand, large number of CABGs dictates that, this can be a very frequently met clinical picture. When left undiagnosed, the results can be dramatic, and the pathology can be the reason for major morbidity, or even mortality. Insufficient LITA flow should have warned us, and intraoperative evaluation for subclavian artery obstructive pathologies must have been done. Also, every surgeon should keep in mind that, a very simple but serious pathology like this can be the cause of postoperative anginal complaints or ECG changes.

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