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Executive office:
Türk Kalp ve Damar Cerrahisi Derneği
Ataşehir Mah., Ataşehir Bulvarı, 48 Ada,
Mimoza 2/2, K: 2, D: 6,
34758 Ataşehir, İstanbul, Turkey
Tel: +90 216 - 456 14 54
Fax: +90 216 - 456 14 54
e-mail: info@tkdcd.org
URL: http://www.tkdcd.org

Editorial Contact Person
Suat Nail Ömeroğlu, MD.
e-mail: suatnail@gmail.com

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Örnek Mah., Dr. Suphi Ezgi Sok., Saray Apt., No: 11, D: 6,
34704 Ataşehir, İstanbul, Turkey
Tel: +90 216 - 317 41 14
Fax: +90 216 - 317 63 68
e-mail: info@baycinartibbiyayincilik.com

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Cardiovascular Surgery and Interventions

Interesting Image Open Access

Densely calcified aortic arch and right coronary artery

Zeki Doğan, Gökhan Bektaşoğlu, Enes Elvin Gül

Department of Cardiology, Istanbul Medicine Hospital, Istanbul, Turkey

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An 80-year-old woman was admitted to the cardiology unit due to ongoing chest pain and shortness of breath. Twelve-lead electrocardiography showed unremarkable findings. As she had ongoing angina and high risk due to her age and history of diabetes, coronary angiography was planned. Coronary angiography revealed a very dense and calcified aortic arch and right coronary artery (RCA) (Figure 1, Video 1). However, we were unable to visualize the RCA, due to severe calcification obstructing the ostium of the artery. There were also severe lesions in the left coronary system. The decision was made in favor of coronary artery bypass grafting; however both the patient and her family members refused this decision and opted to carry on medical treatment. The patient was discharged on the second day of her admission.

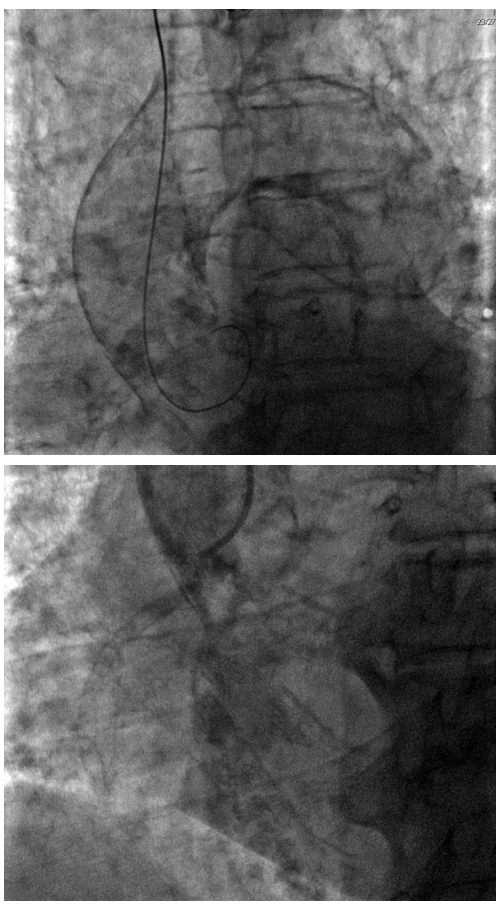

Figure 1. Fluoroscopic images during coronary angiographic examination showing a very clear dense calcification of aortic arch and right coronary artery.

This case demonstrates a very impressive image of severe calcification of the aortic arch and right coronary artery.

Declaration of conflicting interests

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Corresponding author: Enes Elvin Gül, MD. İstanbul Medicine Hastanesi Kardiyoloji Bölümü, 34203 Bağcılar, İstanbul, Turkey.
Tel: +90 212 - 444 02 05 e-mail: elvin_salamov@yahoo.com

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Cardiovascular Surgery and Interventions

Case Report Open Access

Percutaneous cholecystostomy in acute cholecystitis in a patient with stent restenosis suffering from recent non-ST myocardial infarction before coronary artery bypass grafting

Cüneyt Arkan[1], Nuri Havan[2], Selçuk Gülmez[3], Muharrem Dağlı[1], Mehmet Erdem Toker[1]

[1]Department of Cardiovascular Surgery, Kartal Koşuyolu Yüksek İhtisas Training and Research Hospital, Istanbul, Turkey
[2]Department of Radiology, Kartal Koşuyolu Yüksek İhtisas Training and Research Hospital, Istanbul, Turkey
[3]Department of Gastroenterology Surgery, Kartal Koşuyolu Yüksek İhtisas Training and Research Hospital, Istanbul, Turkey

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ABSTRACT

It may be challenging to tailor the treatment of acute cholecystitis in patients undergoing coronary artery bypass grafting due to accompanying comorbid factors. A 62-year-old male patient was admitted to the cardiovascular surgery unit for elective coronary artery bypass grafting. He suffered from non-ST-elevation myocardial infarction a week ago. His medical history revealed insulin-dependent diabetes mellitus and severe chronic obstructive pulmonary disease and also percutaneous coronary interventions in the left anterior descending and circumflex arteries 18 month ago. A coronary artery bypass grafting operation was planned a week after his admission. However, before coronary artery bypass grafting, the patient suffered from abdominal pain, nausea, and vomiting and the diagnosis of acute cholecystitis was made by the gastroenterology department. Percutaneous cholecystostomy was applied under ultrasonographic guidance. After the procedure, the complaints of the patient improved dramatically. Twelve days after the procedure, coronary artery bypass grafting was performed without any perioperative complications. The patient was uneventfully discharged on postoperative Day 8. In conclusion, percutaneous cholecystostomy is an effective method to maintain clinical stability in patients with acute cholecystitis who are candidates for open heart surgery.

Keywords: Acute cholecystitis; comorbidities; coronary artery bypass grafting; percutaneous cholecystostomy.

Acute cholecystitis before an elective coronary artery bypass grafting (CABG) is an unusual condition in daily practice and a very limited number of cases has been reported in the literature. It may be challenging to tailor the treatment of acute cholecystitis in these patients. Simultaneous surgical intervention or a staged procedure in which cholecystectomy is performed first may increase early morbidity and mortality, particularly in the presence of other comorbidities.

Percutaneous cholecystostomy (PC) is a technique which consists of percutaneous catheter placement in the gallbladder lumen under the guidance of imaging modalities and has become an alternative to surgical cholecystectomy in recent years.[1] It is also a well-accepted procedure for acute cholecystitis in high-risk patients.[2]

Herein, we report a case of acute cholecystitis in a patient suffering from recent non-ST elevation myocardial infarction (NSTEMI) before CABG.

CASE REPORT

A 62-year-old male patient was admitted to the cardiovascular surgery unit for an elective CABG. He suffered from NSTEMI a week ago. His medical history revealed insulin-dependent diabetes mellitus and severe chronic obstructive pulmonary disease (COPD) and he was using the bilevel positive airway pressure machine in daily life. Also, percutaneous coronary interventions in the left anterior descending (LAD) and circumflex (Cx) arteries were performed

Corresponding author: Mehmet Erdem Toker, MD. Kartal Koşuyolu Yüksek İhtisas Eğitim ve Araştırma Hastanesi Kalp ve Damar Cerrahisi Kliniği, 34865 Kartal, İstanbul, Turkey.
Tel: +90 505 - 237 98 24 e-mail: mertoker@yahoo.com

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18 month ago. Coronary angiography which was performed in an external center revealed 90% proximal LAD lesions and 70% Cx obtuse margin 2 ($CxOM_2$) lesions and stent restenosis on both arteries. On echocardiography, left ventricle ejection fraction (LVEF) was 65% without any significant valvular problem. Carotid ultrasonography showed a left internal carotid artery stenosis of 50% and no intervention was considered. Pulmonary function test revealed a forced expiratory volume in one second (FEV_1) of 16% and FEV_1/forced vital capacity (FVC) of 50%. The patient was scheduled for an elective CABG one week after his admission and a written informed consent was obtained.

Before CABG, the patient suffered from abdominal pain, nausea, and vomiting and a bedside consultation was performed by the gastroenterology department. He had pain with deep palpation in the right upper quadrant. Abdominal ultrasonography showed an increased diameter of the gallbladder with a minimal thickening. The lumen of the gallbladder had lots of millimetric gallstones and mud. C-reactive protein (CRP) level significantly increased from 0.9 mg/dL to 1.16 mg/dL, 18.6 mg/dL, and 19.8 mg/dL, respectively on consecutive alternate days. Other laboratory test results were as follows: alkaline phosphatase (ALP) 70 U/L, aspartate aminotransferase (AST) 19 U/L, alanine aminotransferase (ALT) 12 U/L, gamma-glutamyl-transferase (GGT) 12 U/L, and amylase 86 U/L. The complete blood count analysis showed an increasing tendency in the white blood cell (WBC) count from 8,700/μL to 10,900/μL, and 11,400/μL on consecutive alternate days. Based on the laboratory and ultrasonographic findings, the patient was diagnosed with acute cholecystitis caused probably by a millimetric gallstone particle obstructing the ductus cysticus. Oral intake was not allowed and intravenous fluid replacement was applied. Antibiotherapy was initiated and the gastrointestinal system was given a rest for a few days.

Ultrasonography and laboratory studies were repeated every two- or three-days. Ultrasonography revealed an increased thickness of wall of the gallbladder. Also, the pericholecystic fluid was seen which was not observed previously. Considering whole these findings, progression of the acute cholecystitis was suspected. The gastroenterology department reevaluated the patient and surgery was considered initially. However, due to comorbidities of the patient, they decided not to operate the patient and referred the patient to the invasive radiology department for PC. A written informed consent was obtained from the patient.

Percutaneous cholecystostomy was applied under the guidance of ultrasonography. After the procedure, the complaints of the patient improved dramatically. During the procedure, 200 mL bile fluid was drained. In the following days, about 50 to 200 mL bile fluid was drained each day. The WBC count was in normal range. Abdominal ultrasonography revealed a decreased size of the gallbladder. The CRP levels dramatically decreased from 19.8 mg/dL, 4.9 mg/dL, and 7.11 mg/dL, respectively. The gastroenterology department suggested that CABG should be done, when the CRP became lower than 5 mg/dL and WBC count was in normal range.

After clinical stabilization, two vessels CABG were performed with saphenous veins for the LAD and $CxOM_2$ arteries 12 days after PC intervention. Left internal mammary artery (LIMA) graft was not used due to decreased flow. There were no major perioperative complications. He was extubated on the postoperative first day. Blood gas analysis showed a partial pressure of carbon dioxide (pCO_2) level of 55 to 60 mmHg. Due to existing COPD, these levels were thought to be well-tolerated and it was the case in our patient. In the following days, the patient was transferred to the ward. The percutaneous gallbladder catheter was withdrawn on the postoperative sixth day. No complication was seen, and the patient was discharged with complete recovery on the postoperative eighth day.

DISCUSSION

Acute cholecystitis before elective CABG is unusual in clinical practice and is even extremely rare following open heart surgery.[3] Several studies have attempted to investigate whether risk factors for coronary artery disease are also risk factors for gallbladder diseases.[4,5] Association of myocardial infarction with gallbladder disease has been previously examined in an epidemiological study;[6] however, it is still not possible to suggest an exact relationship between them.

Percutaneous cholecystostomy is a well-accepted procedure for acute cholecystitis in high-risk patients.[2] It can be used effectively in high-risk patients with cardiac problems, including acute myocardial infarction and other comorbidities.[2,7]

In the present case, surgical cholecystectomy was not considered as an option due to NSTEMI and severe COPD. Therefore, the gallbladder was relieved by draining with PC. Following the intervention, the patient became stable based on clinical, ultrasonographic, and laboratory findings. Subsequently, an elective CABG was performed and the patient was discharged without any postoperative complication.

In conclusion, we believe that percutaneous cholecystostomy is an applicable and feasible method for acute cholecystitis in high-risk patients who are candidates for elective coronary artery bypass grafting.

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Cardiovascular Surgery and Interventions

Case Report Open Access

Unifocalization in Glenn shunt operation due to anatomical difficulty: A case report

Çağatay Bilen, Gökmen Akkaya, Osman Nuri Tuncer, Mehmet Fatih Ayık, Yüksel Atay

Department of Cardiovascular Surgery, Ege University School of Medicine, Izmir, Turkey

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ABSTRACT

Glenn shunt operation is performed to increase the pulmonary blood flow in congenital heart diseases in which ambulatory correction is unable to be performed. Pulmonary arterial flow is being balanced and thrombosis frequency is reduced via applying unifocalization of the vena cava superior in patients with bilateral vena cava superior undergoing bidirectional Glenn shunt operation. Herein, we present a case who underwent unifocal bidirectional Glenn shunt operation due to anatomical discordance.

Keywords: Glenn shunt, pulmonary artery, unifocalization.

Glenn shunt operation is a procedure used as a preoperative step prior to the Fontan procedure and is safer than single-stage Fontan procedure with lower mortality rates.[1,2] Glenn shunt was revised in 1958 to be called bidirectional Glenn shunt and was described as an anastomosis of the pulmonary artery with vena cava superior (VCS) on the same side.[3] Bilateral bidirectional Glenn shunt operation is applied to cases with bilateral VCS.[4] This procedure leads to decreased shunt flow and unbalanced pulmonary blood flow, and increased frequency of stasis and thrombosis.[5] A new step has been added to the operation of the Glenn due to these problems which is called the unifocalization of the bilateral VCS. In this report, we present a case underwent unifocal bidirectional Glenn shunt operation and the unifocalization procedure.

CASE REPORT

A four-year-old male patient on the post-natal first day echocardiogram, unbalanced atrioventricular channel, single ventricle, pulmonary atresia, and double outlet right ventricle (DORV) were detected. The patient who was assessed at the council was not found to be eligible for biventricular repair. Due to the cardiac pathologies, the patient underwent left-sided modified Blalock-Taussig (MBT) shunt operation, when he was two days old. Pulmonary artery development was found to be deficient during the postoperative catheterization. Therefore, right MBT shunting was applied to the patient at the age of three. In further years, due to the limited pulmonary arterial development and occluded right MBT shunt which were detected during clinical follow-up via transthoracic echocardiography (TTE) and cardiac catheterization, and a new right MBT shunt procedure was performed for the third time at the age of seven. Routine physical examination at the time of hospital admission revealed a 2/6 systolic murmur at the pulmonary valve area. Central cyanosis was also present on physical examination. Thoracic computed tomography (CT) showed malposition of the great arteries, atrial septal defect (ASD), ventricular septal defect (VSD), DORV, pulmonary stenosis, and left persistent VCS (LPVCS). The preoperative TTE results also supported the CT findings which showed a difficult access to the left pulmonary artery (Figure 1).

In the final cardiac catheterization, the McGoon index was measured as 1.8 and both left and right pulmonary arteries were measured as 12 mm. Pulmonary artery pressures were found to be 15/9/12 mmHg. Therefore, the heart team decided to

Corresponding author: Çağatay Bilen, MD. Ege Üniversitesi Tıp Fakültesi Kalp ve Damar Cerrahisi Anabilim Dalı, 35100 Bornova, İzmir, Turkey.
Tel: +90 232 - 390 35 71 e-mail: cagataybilen86@gmail.com

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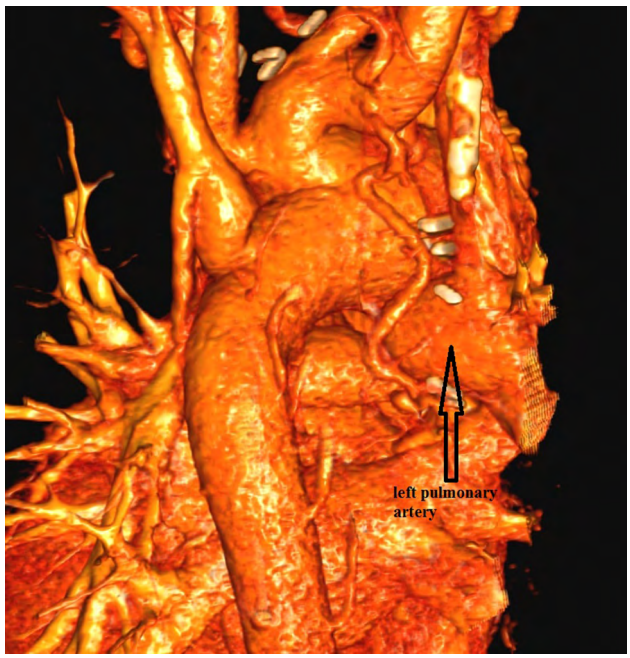

Figure 1. A computed tomography image of left pulmonary artery.

perform a Glenn shunt operation. A written informed consent was obtained from each parent.

The patient was taken to the Glenn shunt operation. Median sternotomy was performed under endotracheal general anesthesia. Adhesions were

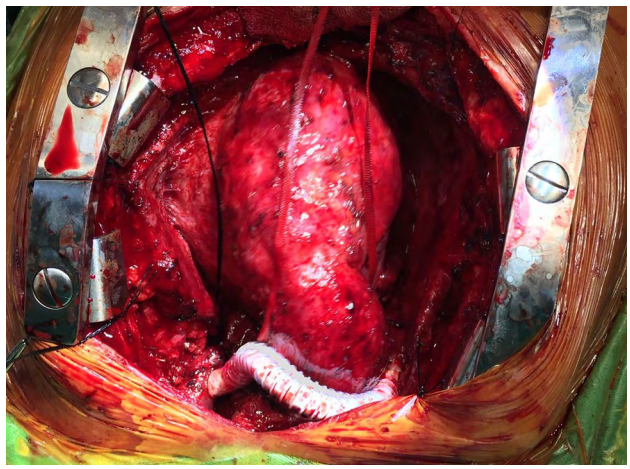

Figure 2. An introperative view of surgical field after procedure.

removed with blunt dissection. Bilateral VCS were reached and circled. The right MBT shunt was reached and turned. The left pulmonary artery was in a compelling position to be operated beneath the left atrium. First, the right VCS was amputated from where it merged with the right atrium. The amputated stump at the right atrium was, then, closed with primary sutures. The right VCS was anastomosed in an end-to-side fashion to the right pulmonary artery. The LPSVC diameter was measured as 12 mm in width with 22 mmHg pressure

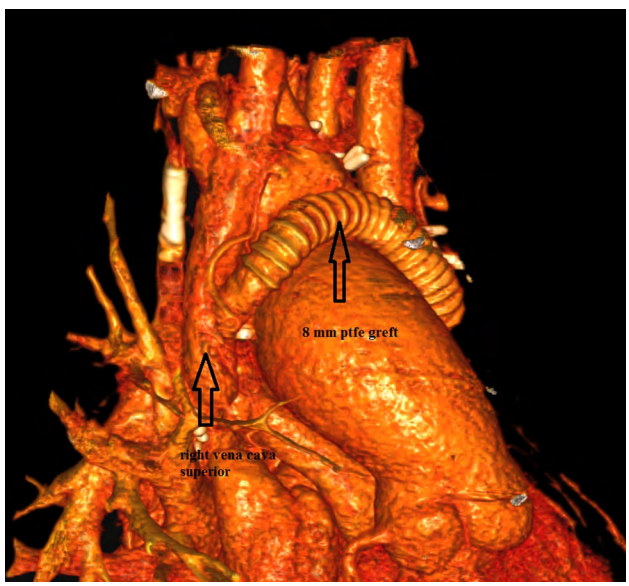

Figure 3. A postoperative three-dimensional computed tomography image of the PTFE graft between right and left superior caval veins.

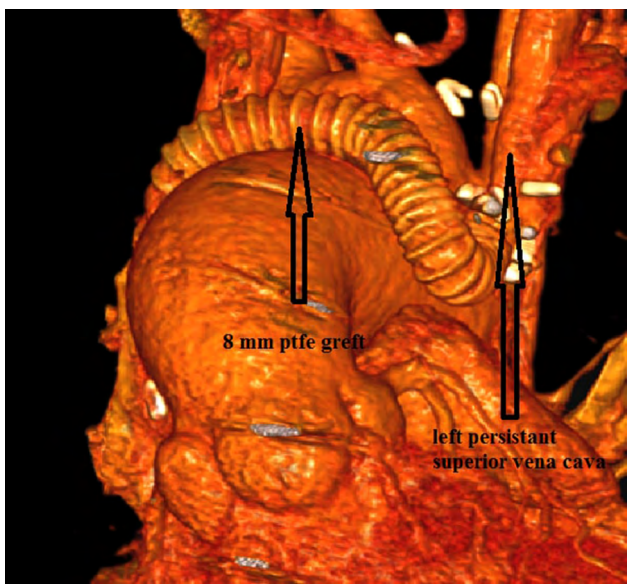

Figure 4. A postoperative three-dimensional computed tomography image of the PTFE graft between right and left superior caval veins.

intraoperatively. Therefore, LPSVC was ligated in the distal line and planned to be anastomosed with the right VCS. Nevertheless, due to the lack of enough length, the anastomosis was able to perform via an 8-mm polytetrafluoroethylene (PTFE) ring graft. We ligated the distal part of the LPVCS and right MBT shunt. Following the bleeding control, a drain was placed in both thoraces. The operation was terminated by closing the layers appropriately to the anatomy (Figure 2).

The patient was intubated and taken to the intensive care unit. He was hemodynamically stable and did not need any inotropic support. We started antiaggregant and low-molecular-weight heparin (LMWH) treatment to the patient. He was extubated five hours after surgery. At the end of the first day, he was transferred to the ward and discharged on the postoperative eighth day. During discharge, we discontinued the LMWH treatment and continued with antiaggregant therapy. One month after the operation, control TTE showed that and the Glenn shunt was still functioning. Control CT angiography showed the 8-mm PTFE graft and patent Glenn shunt anastomosis (Figure 3, 4).

DISCUSSION

Bilateral VCS anatomy causes thrombosis due to unbalanced blood flow after Glenn shunt operation.[5] Also, blood flow from the vena cava inferior after the Fontan procedure is not sufficient to correct the unbalanced pulmonary blood flow. This unbalanced blood flow to the pulmonary bed leads to arteriovenous malformations, which later impairs the patient comfort.[6] Using this method, the frequency of these problems can be reduced.

The cava-pulmonary anastomosis performed during the procedure should not be small. Otherwise, edema is more common at the upper part of the body than bilaterally bidirectional Glenn shunt operation, and unequal pulmonary blood flow after bilateral bidirectional Glenn shunt operation can be seen in this method. Another important point is to ensure that the newly created innominate vein does not compress the aortic arch and its branches in the posterior. In a study of 65 patients, Kawasaki et al.[7] observed that the perfusion of the pulmonary blood flow was balanced in the patients who underwent unifocalization procedure. In addition, Bilal et al.[8] reported a case series including four patients in whom the LPSVC diameter was equal to the VCS and maintained the large part of systemic venous return which was threaded with a synthetic graft with an uneventful follow-up. In our case, the Glenn shunt operation with unifocalization of the VCS was performed by considering that the shunt would not run due to the large LPVCS and left anastomosis of the left atrium sizes during the operation and the other aforementioned reasons in the article.

In conclusion, unifocalization technique should be kept in mind as a feasible option, when the access of the pulmonary artery has risks and difficulties in patients undergoing the Glenn shunt operation.

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Cardiovascular Surgery and Interventions

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Endovascular intervention to a rare cause of hematuria: Nutcracker syndrome - A case report

İsmail Selçuk[1], İbrahim Alp[1], Murat Fatih Can[2], Murat Uğur[1], Ahmet Turan Yılmaz[1]

[1]Department of Cardiovascular Surgery, Sultan Abdulhamid Han Training and Research Hospital, Istanbul, Turkey
[2]Department of Cardiovascular Surgery, Bayburt State Hospital, Bayburt, Turkey

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ABSTRACT

Nutcracker phenomenon is described as the compression of the left renal vein between the superior mesenteric artery and aorta. Nutcracker syndrome (NCS) refers to clinical manifestations of the Nutcracker phenomenon. Although asymptomatic cases do not often require any intervention, symptomatic cases can be treated with medial nephropexy and excision of the renal varices, left renal vein bypass, transposition of the left renal vein, or stent placement in the left renal vein. Herein, we present a case with NCS and its management with endovascular intervention.

Keywords: Endovascular approach, Nutcracker syndrome, renal vein.

Nutcracker phenomenon is described as the compression of the left renal vein between the superior mesenteric artery and aorta characterized by renal vein stenosis at the level of the compression, increased renal vein compression, and renal vein dilatation proximal to the compression site. Infrequently, however, this phenomenon may occur at the retroaortic or circumaortic region due to the unusual course of the left renal vein.[1]

Nutcracker syndrome (NCS) refers to the symptoms and findings of hematuria, orthostatic proteinuria, pelvic congestion, varicocele, and flank pain due to the increased left renal vein compression.[2] Although asymptomatic cases do not often require any intervention, symptomatic cases can be treated with medial nephropexy and excision of the renal varices, left renal vein bypass, transposition of the left renal vein, or stent placement in the left renal vein.[3] Herein, we present a case with NCS and its management with endovascular intervention.

CASE REPORT

A 20-year-old female patient was admitted to our hospital with persistent fatigue, dark colored urination, and severe left flank pain lasting for four months. Her medical history revealed blood transfusion for two times due to severe anemia. The laboratory tests for urine and blood examination showed macroscopic hematuria, proteinuria, a hemoglobin level of 8.26 g/dL, and a hematocrit level of 22.5%. Computed tomography angiography revealed compression of the left renal vein between the superior mesenteric artery and aorta. Additionally, a dilated venous segment was noticed proximal to the compression site (Figure 1). According to the work-up performed at our clinic, the patient was diagnosed with NCS and an elective surgical intervention was planned. However, considering the young age of the patient and her aesthetic concerns, minimally invasive left renal vein stent implantation using an endovascular approach was decided.

A written informed consent was obtained from the patient. Initially, a 6F sheath was inserted to the right common femoral vein to access to the left renal vein through the inferior vena cava. The left renal vein was passed via an 0.035-inch guidewire and the lesion

Corresponding author: Murat Uğur, MD. Sultan Abdulhamid Han Eğitim ve Araştırma Hastanesi Kalp ve Damar Cerrahisi Kliniği, 34668 Üsküdar, İstanbul, Turkey. Tel: +90 216 - 542 20 00 / 4055 e-mail: drmugur@gmail.com

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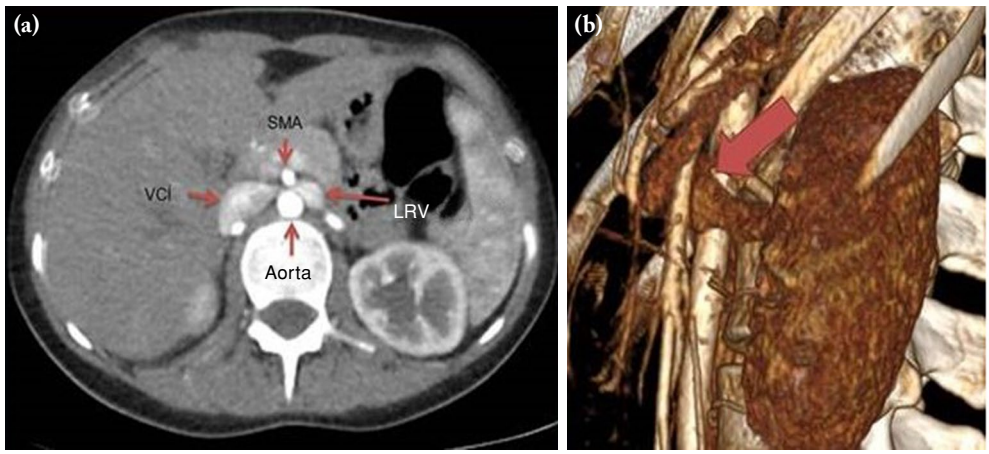

Figure 1. A computed tomography angiography showing the left renal vein compression at **(a)** transverse plane and **(b)** three-dimensional plane. SMA: Superior mesenteric artery; VCI: Vena cava inferior; LRV: Left renal vein; Ao: Aorta.

was predilated with a 10-mm × 4-cm balloon catheter, followed by a 14-mm × 40-mm self-expanding stent implantation. The procedure was terminated, when control angiography demonstrated the elimination of stenosis (Figure 2). On the postoperative second day, macroscopic hematuria disappeared as confirmed by the urinalysis which showed no evidence of microscopic hematuria. In addition, the hemoglobin and hematocrit levels return to normal range on the postoperative third day. The patient was discharged with complete recovery.

DISCUSSION

Nutcracker syndrome should be kept in mind in the differential diagnosis of hematuria in young adults due to its life-threatening complications, although it is a rare entity. It can cause recurrent hematuria episodes, leading to severe anemia requiring multiple blood transfusions in younger patients, as seen in our case.

Traditionally, NCS was treated with major surgeries, such as medial nephropexy with excision of dilated veins, left renal vein bypass, and left renal vein transposition. However, these procedures are currently preferred in limited, clinically symptomatic cases due to associated complications and low patency rates of renal vein bypass surgery. In recent years, a higher number of cases has been treated with endovascular surgery with higher rates of experiences with advanced surgical techniques. Therefore, renal vein stent implantation has become the first-line

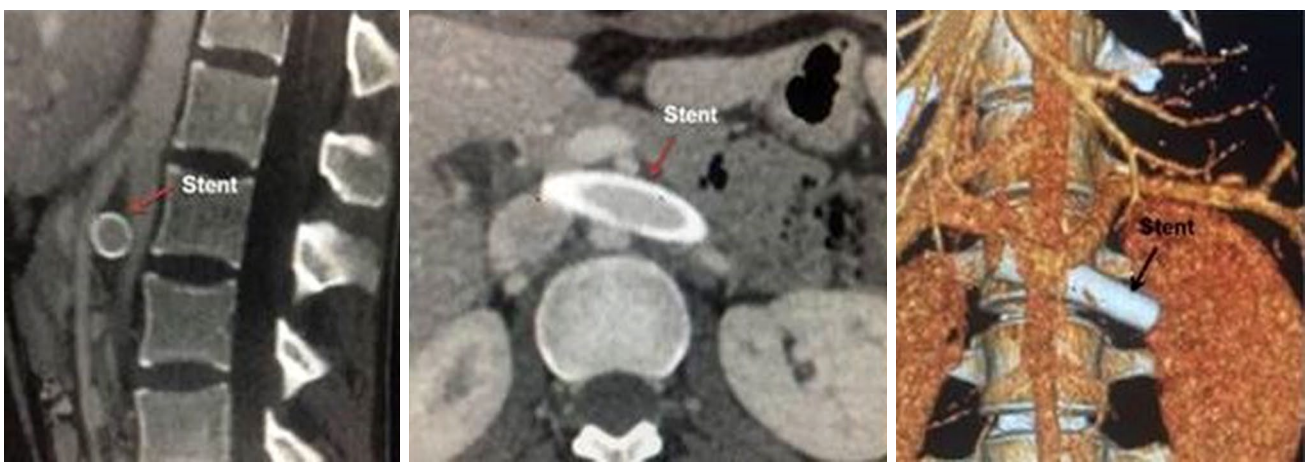

Figure 2. Postoperative angiography showing stent and renal vein.

procedure in the treatment of NCS.[4] Furthermore, a shorter duration of symptomatic improvement in the postoperative period and promising long-term patency rates of the stents encourage clinicians to treat NCS at earlier stages.

In the conventional approach to the NCS, most of the patients have been untreated still complications are developed. With the increased awareness of endovascular options for the treatment of the NCS, patients might be treated in the earlier stages of the disease. This treatment option will improve life quality of the patients before the symptoms occurred.

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