Finally, in a 56 year-old man referred for coronary angiography because of heart failure and poor left ventricular ejection fraction, a DSA independently originated from the right coronary sinus was accidentally cannulated (Figures 2A-2B) while attempting to localize the RCA with a Judkins right catheter via the right radial artery. The RCA had a normal origin. The posterolateral branch of the RCA continued toward the atrioventricular groove giving marginal branches (Figure 2C), thus replacing an orthotopic circumflex artery. An ectopic LAD arising from the right coronary sinus (Figure 2D) was identified. No significant lesions were detected.

Available information about DSA arises from post-mortem studies, which report an incidence varying from 12% to 85%.[2] This contrasts with its extremely infrequent identification in clinical practice. This difference could be explained by the higher perfusion pressures used and the absence of vascular tone in post-mortem specimens.[2] Furthermore, the position of the catheter a few millimeters distal to the RCA ostium during coronary angiography can easily mask this branch.

The DSA can arise from up to 4 different locations and the anatomical variant originating from the first centimeter of the RCA is the most frequent.[1] In an attempt to homogenize the angiographic description of the DSA, we propose to define as type I those variants emerging within the proximal segment of the RCA; type II as those sharing a common ostium with the RCA; type III as those sharing an ostium with the conal branch and type IV as those arising independently from the right coronary sinus.

The DSA provides blood supply to the posterobasal aspect of the interventricular septum, the atrioventricular node, and the His bundle. In the presence of coronary artery disease, its role as a source of collateral circulation has been recognized.[1,2] These anastomoses are mainly connected with other septal branches[3]

The DSA can rarely be part of a combined coronary artery anomaly. The third case presented is extremely rare and, to the best of our knowledge, no similar coronary anomaly has been described. The DSA can be of interest even in patients with hypertrophic cardiomyopathy. Kurita et al[4] performed a percutaneous septal alcohol ablation through a DSA, preceded by the demonstration of its contribution to the perfusion of the basal interventricular septum.

Technical aspects concerning the evaluation of the DSA should be addressed. A relatively deep cannulation of the RCA may prevent its identification. A DSA arising from an independent ostium is mostly accidentally identified while attempting to find the RCA. Contrast back-flow during injections in the RCA might reveal its presence. Nonselective contrast injections in the right coronary sinus could be used when a DSA is strongly suspected, especially in the absence of a well-developed first septal branch in the LAD. Multipurpose or Amplatz right catheters might be useful to selectively engage the DSA. The role of noninvasive techniques in evaluating DSA seems to be limited. The trajectory and the small caliber of this vessel could hamper its delimitation (Figures 1B and 2E).

DSA is an infrequent finding during coronary angiography that can be of interest in specific scenarios. Operators should be aware of its existence and perform a careful evaluation particularly in those situations in which a DSA might have therapeutic implications.

Jose M. Montero-Cabezas,* Aly M. Tohamy, Ioannis Karalis, Victoria Delgado, and Martin J. Schalij

Department of Cardiology, Leiden University Medical Center, Leiden, The Netherlands

*Corresponding author:
E-mail address: J.M.Montero_Cabezas@lumc.nl
(J.M. Montero-Cabezas).

Available online 9 October 2015

REFERENCES

1. Rodriguez FL, Robbins SL, Banasiewicz M. The descending septal artery in human, porcine, equine, ovine, bovine, and canine hearts. A post-mortem angiographic study. Am Heart J. 1961;62:247–59.
2. Said M, Mühlberger VA. The descending septal branch (Bonapace's branch). A case report and literature review of this often forgotten branch. First description in vivo. Eur Heart J. 1995;16:1443–7.
3. Sanghvi K, de Leon Mansson S, Patel T. Descending septal artery: an important artery for collateral coronary circulation. J Invasive Cardiol. 2013;25:E30–2.
4. Kurita T, Tsuchikane E, Tanaka N, Suzuki T. Successful percutaneous transluminal septal myocardial ablation through a right superior septal artery for a patient with hypertrophic obstructive cardiomyopathy. Cardiovasc Interv Ther. 2014. 13 [Epub ahead of print].

http://dx.doi.org/10.1016/j.rec.2015.07.010

Hemoperitoneum Due to Left Inferior Phrenic Artery Injury During Pericardiocentesis

Hemoperitoneo secundario a lesión de la arteria diafragmática inferior izquierda tras pericardiocentesis

To the Editor,

Hemoperitoneum is a major cause of acute abdomen, and documented evidence suggests that pericardiocentesis is a possible underlying iatrogenic cause.

We present the case of a 76-year-old man who developed a hemoperitoneum and hypovolemic shock secondary to injury to the left inferior phrenic artery during echo-guided pericardiocentesis. Surgery was required to stop the bleeding.

The patient presented with exertional dyspnea, orthopnea, oligoanuria, and lower limb edema. The patient had a history of arterial hypertension, dyslipidemia, type 2 diabetes, obesity, peripheral vascular disease, diabetic retinopathy, chronic kidney disease, chronic obstructive pulmonary disease, intestinal angiodysplasia, and ischemic stroke treated with clopidogrel. Cardiopulmonary auscultation revealed arrhythmic and muted heart sounds with bibasal crackles. An electrocardiogram and blood enzyme analysis revealed no signs of myocardial ischemia, but did show a worsening of renal function parameters compared with previous readings. Suspected heart failure was assessed by echocardiography, which revealed severe pericardial effusion (26 mm) with signs of hemodynamic deterioration. Echo-guided subxiphoid pericardiocentesis was performed, without attaching a drainage catheter, yielding a serous fluid with no atypical cells in the pathological analysis.

The patient made good clinical progress, but on the sixth day after the pericardiocentesis he developed sudden symptoms of hypotension and tachycardia that did not respond to volume infusion. A bedside examination by focused assessment with sonography in trauma (FAST) revealed abundant free intra-abdominal fluid, with limited pericardial effusion. Blood analysis showed a decrease in hemoglobin concentration from 11.7 d/dL to 5.5 g/dL and a Quick index of 87%. Due to the hemodynamic instability, the decision was taken to perform an emergency laparotomy, revealing a 3200 mL hemoperitoneum and a free flowing hemorrhage of the left inferior phrenic artery, with no other abdominal lesions. Bleeding was controlled by clamping (Figure) and hemostatic suture with 2/0 monofilament suture

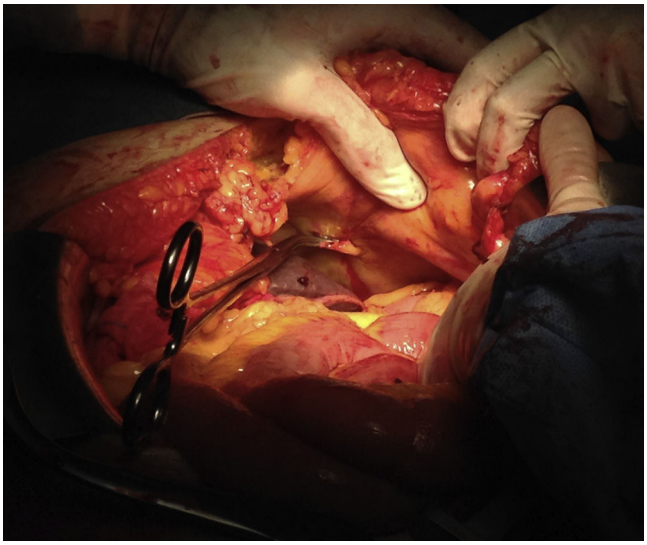

Figure. Intraoperative photograph showing clamping of the left inferior phrenic artery.

thread. During the intervention, the patient needed blood transfusion with 4 units of red blood cells, 1 platelet pool, and 3 units of fresh plasma. The patient made satisfactory clinical progress, returning to oral nutrition, recovering bowel transit, and showing improved cardiac function and a return to normal hemoglobin concentration. The patient was discharged from hospital 21 days after the intervention.

When associated with hemodynamic instability or serious injury to abdominal viscera, hemoperitoneum is a clinical situation that requires emergency surgery due to the associated high mortality.

The causes of hemoperitoneum can be divided into traumatic (open or closed abdominal trauma) and nontraumatic (coagulation disorders, gynecological illness, gastrointestinal perforation, spontaneous rupture of organs or neoplasms, pancreatitis, and vascular or idiopathic alterations). Cases of iatrogenic hemoperitoneum have been reported after percutaneous puncture for drainage of fluid collections, biopsy extraction, or thoracentesis or after procedures such as epicardial ablation of arrhythmias via the intrapericardial route[1]; however, there have been no previous reports of the need for laparotomy to stop the bleeding.

Complications secondary to pericardiocentesis are today rare (less than 4%) due to the use of ultrasonography, and the most frequently reported complications are arrhythmias, pneumothorax, and injury to the myocardium or coronary arteries. Less frequent complications are peritoneopericardial communication in peritoneal dialysis patients,[2] pneumoperitoneum, hepatic or gastric puncture, and injury to the diaphragm or internal thoracic artery.[3]

Hemoperitoneum due to injury to the inferior phrenic artery has been documented in multiple trauma victims, patients with neoplasms or chronic pulmonary disease, and those undergoing thoracic surgery or toracentesis.[4] In almost half of cases, the inferior phrenic arteries originatefrom the abdominal aorta, as a common branch or as independent arteries. In 45% of cases, they emerge from the celiac trunk, and in very rare cases they originate from other arteries, such as the left renal (5%), left gastric (2%), or hepatic artery (1%).[5] Hemorrhage secondary to injury to these arteries is normally mild and self-limiting. Therefore, if the patient is hemodynamically stable, the recommended therapeutic measures are clinical observation and monitoring of analytical and imaging parameters. Other treatment options, such as embolization of the injured artery by interventional radiology techniques, might be indicated in hemodynamically stable patients with no other diaphragmatic or abdominal injuries.[3] Otherwise, in patients showing signs of instability, a FAST examination is mandatory. This simple and reproducible test is conducted with a 3.5-MHz ultrasound probe at the patient's bedside and detects pericardial or pleural effusion and free abdominal fluid with high sensitivity and accuracy,[6] providing an indication for emergency laparotomy in cases of suspected hemoperitoneum.

Sara Jareño Martínez,[a,*] Marcos Bruna Esteban,[a] Ruth Núñez Ronda,[a] Isabel Grifo Albalat,[a] and Óscar Fabregat-Andrés[b]

[a]*Servicio de Cirugía General y del Aparato Digestivo, Consorcio Hospital General Universitario de Valencia, Valencia, Spain*
[b]*Servicio de Cardiología, Consorcio Hospital General Universitario de Valencia, Valencia, Spain*

*Corresponding author:
E-mail address: sjareno@hotmail.com (S. Jareño Martínez).

Available online 28 September 2015

REFERENCES

1. Yamada T, Kay GN. Recognition and prevention of complications during epicardial ablation. Epicardial interventions in electrophysiology. Cardiac Electrophysiology Clinics. 2010;2:1–150.
2. Hou CH, Tsai TJ, Hsu KL. Peritoneopericardial communication after pericardiocentesis in a patient on continuous ambulatory peritoneal dialysis with dialysis pericarditis. Nephron. 1994;68:125–7.
3. Flitch MT, Nicks BA, Pariyadath M, McGinnis HD, Manthey DE. Videos in clinical medicine. Emergency pericardiocentesis. N Engl J Med. 2012;366:e17.
4. Jones BV, Vu D. Diagnosis of posttraumatic pericardial taponade by plain and computed tomography and control of bleeding by embolotherapy of the left inferior phrenic artery. Cardiovasc Intervent Radiol. 1993;16:183–5.
5. Gwon DI, Ko GY, Yoon HK, Sung KB, Lee JM, Ryu SJ, et al. Inferior phrenic artery: anatomy, variations, pathologic conditions, and interventional management. Radiographics. 2007;27:687–705.
6. Tayal VS, Beatty MA, Marx JA, Tomaszewski CA, Thomason MH. FAST (focused assessment with sonography in trauma) accurate for cardiac and intraperitoneal injury in penetrating anterior chest trauma. J Ultrasound Med. 2004;23:467–72.

http://dx.doi.org/10.1016/j.rec.2015.07.008