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Origin of a common trunk for the inferior phrenic arteries from the right renal artery: a new anatomic vascular variant with clinical implications

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Abstract The inferior phrenic arteries constitute a pair of important vessels, supplying multiple organs including the diaphragm, adrenal glands, esophagus, stomach, liver, inferior vena cava, and retroperitoneum. The vast majority (80–90%) of inferior phrenic arteries originate as separate vessels with near equal frequency from either the abdominal aorta or the celiac trunk. Infrequently, the right and left inferior phrenic arteries can arise in the form of a common trunk from the aorta or from the celiac trunk. We herein present three patients with a new anatomic vascular variant: a common trunk of the inferior phrenic arteries arising from the right renal artery. In one case, the left inferior phrenic branch of the common trunk provided collaterals connecting with a supra-diaphragmatic branch of the left internal mammary artery and in another with the lateral wall of the pericardium. Angiographic identification of a common trunk for the inferior phrenic arteries arising from the right renal artery is important for proper diagnosis and clinical management. The presence of this unique vascular variant can impact revascularization of the renal arteries.
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Keywords: Inferior phrenic artery; Common trunk; Renal artery; Variant; Anomalous; Vessel

1. Introduction

The inferior phrenic arteries constitute a pair of important vessels, supplying multiple organs including the diaphragm, adrenal glands, esophagus, stomach, liver, inferior vena cava, and retroperitoneum [1–7]. The vast majority (80–90%) of inferior phrenic arteries originate as separate vessels with near equal frequency from either the abdominal aorta or the celiac trunk [3,7,8]. Infrequently, the right and left inferior phrenic arteries can arise in the form of a common trunk from the aorta or from the celiac trunk [1,2,8]. Angiographic identification of these vessels and their variants is important for proper diagnosis and clinical management.

We herein present three patients in whom selective renal arteriography identified a new anatomic vascular variant: a common trunk of the inferior phrenic arteries arising from the right renal artery. In one case, the left inferior phrenic branch of the common trunk provided collaterals connecting with a supradiaphragmatic branch of the left internal mammary artery and in another with the lateral wall of the pericardium.

2. Case 1

A 60-year-old Caucasian male with coronary artery disease, diabetes mellitus Type 2, hypertension, and hyperlipidemia underwent a three-vessel coronary bypass

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surgery in 2004. A year later, he developed angina pectoris and underwent a percutaneous coronary intervention with placement of three stents in the proximal and middle segments of the circumflex artery. In 2008, recurring angina led to angiography which demonstrated total occlusion of the stents; however, attempted targeted percutaneous coronary intervention failed. In 2009, he presented again with unstable angina pectoris. Cardiac catheterization demonstrated a patent left main coronary artery and 100% occlusion of the proximal left anterior descending artery and the proximal left circumflex artery. The right coronary artery was a dominant, patent vessel supplying a posterior descending artery. The left internal mammary artery graft to the left anterior descending artery was patent with adequate distal flow into the native vessel. Saphenous vein grafts to an obtuse marginal branch of the circumflex artery and the posterior descending artery were completely occluded at their aortic origin. Selective renal angiography demonstrated normally arising and patent bilateral renal arteries. A large common trunk of the phrenic arteries measuring 4 mm in diameter

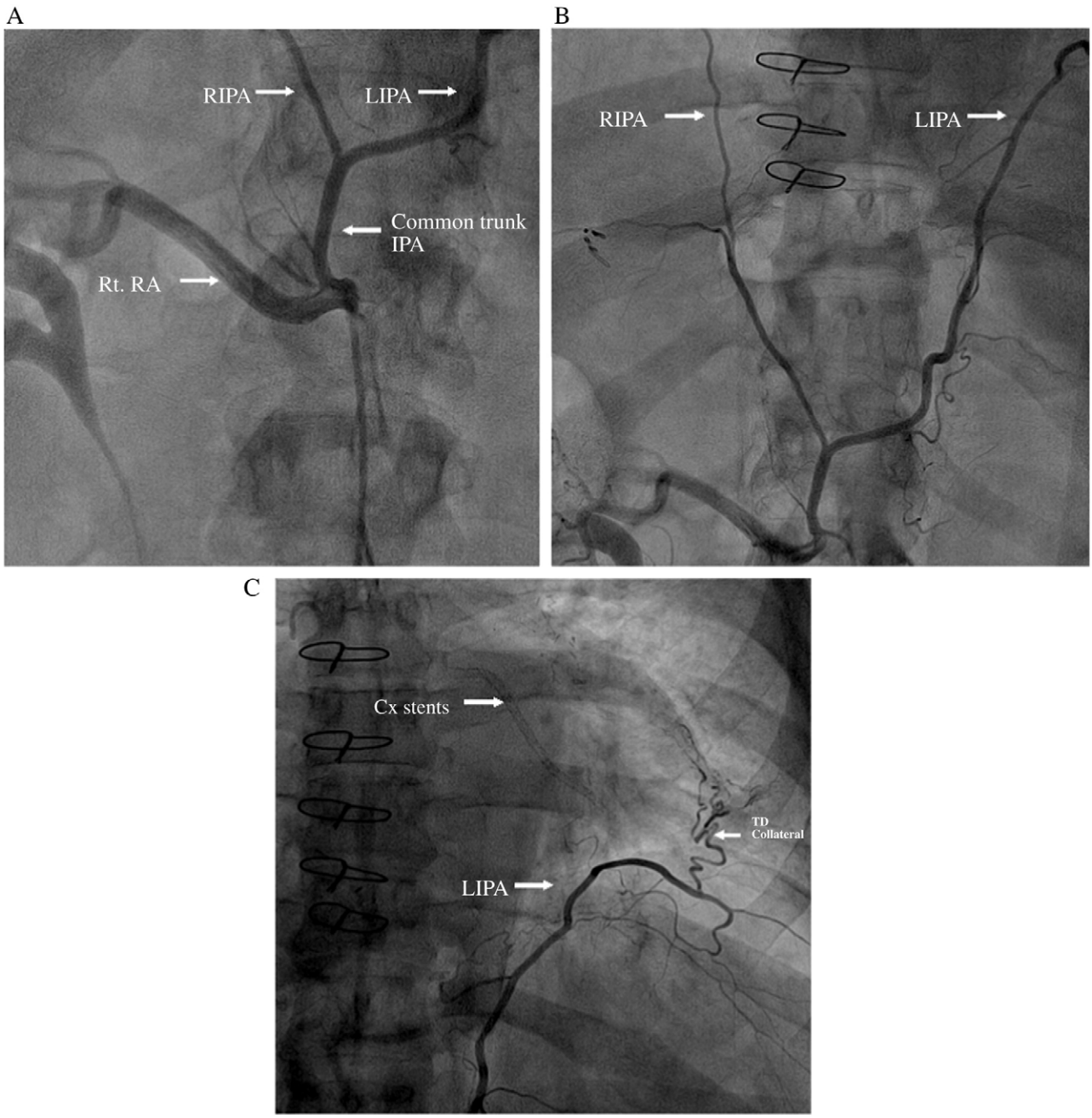

Fig. 1. (A) Selective angiogram demonstrating the origin of the common trunk of the inferior phrenic arteries (IPA) from the proximal right renal artery (Rt. RA). The bifurcation of the common trunk IPA into right (RIPA) and left (LIPA) inferior phrenic arteries is depicted. (B) The middle segments of the RIPA and LIPA. (C) Distal segment of the LIPA providing trans-diaphragmatic (TD) collateral. Occluded stents are shown in the circumflex (Cx) artery.