"Marsupial cava" and ruptured abdominal aortic aneurysm

A case report and review of the literature

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A patient with a ruptured abdominal aortic aneurysm underwent an emergency operation. A rare anomaly of inferior vena cava, known as "marsupial cava," was found. The iliac vein confluence crossed anteriorly (rather then posteriorly) the right common iliac artery. Even though the patient had undergone a computed tomography scan, this rare anomaly had not been detected and therefore was unexpected by the surgeon. The aim of this report is to describe the technical details required to perform the aortic reconstruction and to stress the importance of routine computed tomography scans and their careful reading in the case of stable patients before retroperitoneal operation. This is, to our knowledge, the first report of an aortic prosthetic grafting for ruptured aortic aneurysm in association with a marsupial cava. (J Vasc Surg 1998;28:719-22.)

The complex developmental process of the inferior vena cava (IVC) during the first trimester of pregnancy can understandably produce a variety of venous anomalies. The prompt recognition of these in preoperative examinations by a trained radiologist and a surgeon is important in candidates for abdominal aortic surgery. IVC anomalies occur relatively infrequently in clinical practice, and surgeons have little opportunity to accumulate much experience. The preoperative knowledge of some of these anatomic features is crucial to prevent devastating hemorrhagic complications during operations. This report illustrates the presence of "marsupial cava" in a patient who underwent emergency surgery for ruptured abdominal aortic aneurysm (AAA). This rare IVC anomaly, in which the caval confluence lies anteriorly to the aortic bifurcation rather than posteriorly, had not been detected by previous contrast-enhanced computed tomography (CT) scanning and thus was unexpected by the surgeon.

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CASE REPORT

A 65-year-old white man with a known aortic aneurysm complained of a persistent left lower abdominal pain that had worsened 2 days earlier. The CT scan revealed a 5-cm infrarenal aneurysm that expanded posteriorly and to the left, with doubtful aspects of rupture. The presence of a preaortic iliac veins confluence was undetected, even if the CT features were typical (Fig 1). Because the hematocrit was decreasing rapidly and sonography was ineffective in determining the diagnosis, the patient underwent an emergency median laparotomy for a suspected ruptured AAA. The aneurysm was ruptured anteriorly but sealed by retroperitoneal hematoma. On opening of retroperitoneum, a normally right-sided IVC was found arising from an iliac vein confluence located anteriorly to the right common iliac artery (CIA) (Fig 2). The large venous confluence completely hid the right CIA and the aortic bifurcation. Through careful blunt dissection, the right iliac artery bifurcation was slightly mobilized to obtain the space required to clamp the external and internal iliac arteries. After aortic and bisiliac clamping, an arteriotomy on the anterior side of the aneurysm was performed, from the proximal aneurysmal neck down to the distal left CIA. After opening of the aneurysmal sac, the aortic orifice of the right CIA was internally sutured so as to stop a light, but annoying, back bleeding that was possibly due to some aberrant right CIA collateral vessel. The aorto-bisiliac expandable polytetrafluoroethylene graft was positioned with its right branch in front of the caval confluence and sutured terminoterminally at the right iliac bifurcation. The patient did well and was discharged from the hospital 10 days postoperatively without any sign of swelling in the lower limbs.

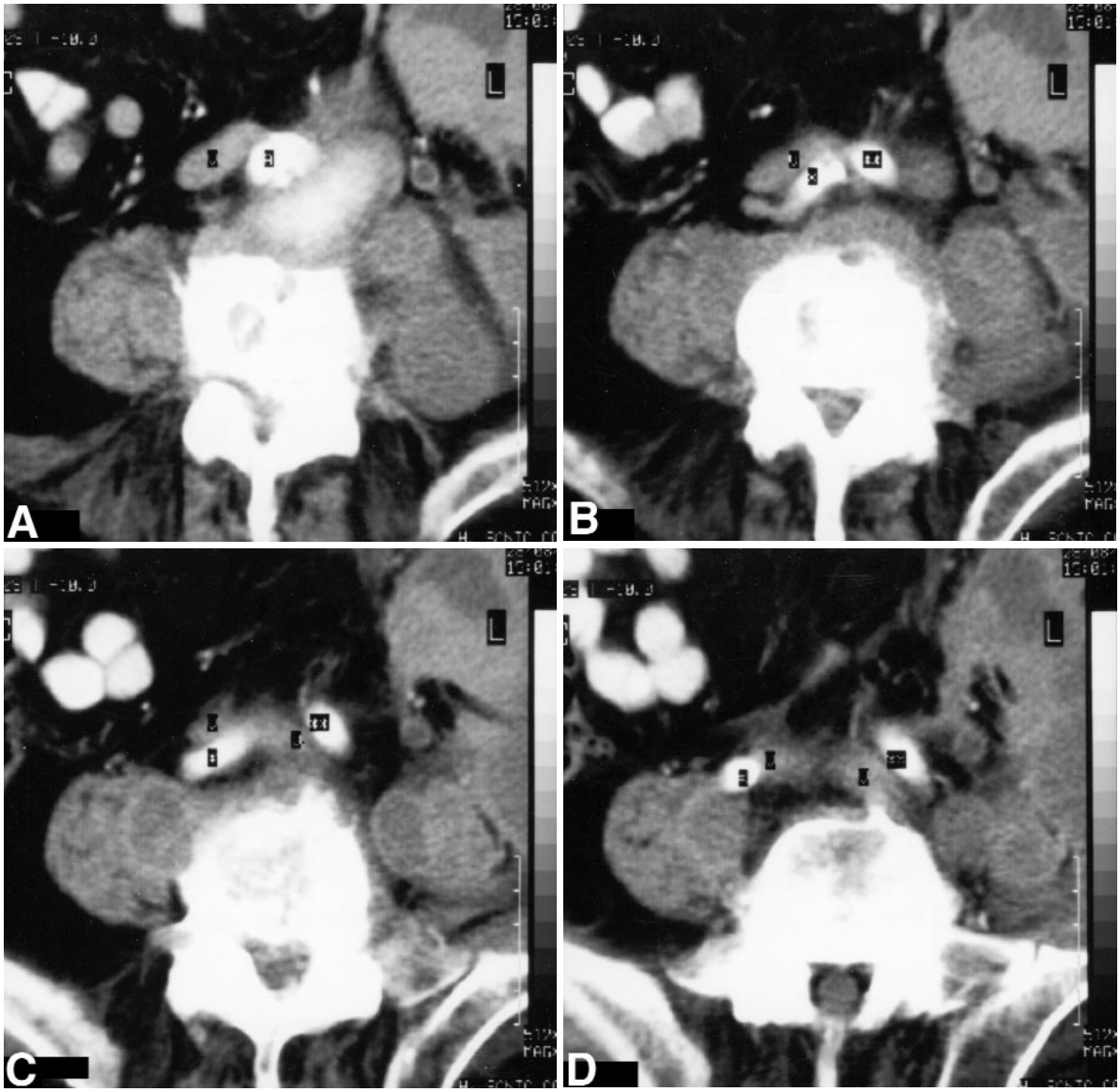

Fig 1. Clockwise from top left: computed tomography scan of the relationships between the caval confluence and the aorta. The thickness of the slices is 10 mm. Craniocaudal sequence. *V,* Vena cava, iliac veins. *Right CIA. **Left CIA.

DISCUSSION

The anatomic relationships of IVC, its tributaries, and abdominal aorta are the result of a complex developmental process in which the IVC is the outcome of complex anastomoses among three paired embryological venous systems (posterocardinal, supracardinal, and subcardinal), with enlargement and consolidation of some vessels and regression of others. At stage 12 embryo (4 mm, 21 days), these paired veins are roughly symmetrical. At stage 16 and 17 embryo (37 to 44 days), a complex venous plexus appears in the lumbar region, with consolidation of various anastomoses between posterocardinal and supracardinal veins and with further development of circumumbilical venous rings, which surround the future CIA on each side. By the end of stage 21 embryo, the ventral portion of the venous rings normally disappears.[1] The persistence of a ventral anastomosis between interposterocardinal veins and supracardinal veins and the regression of the dorsal venous pathways gives rise to the preaortic common iliac veins confluence later on in fetal life. Gladstone[2] reported the findings at postmortem

anatomic dissection of a patient with retrocaval right CIA. Edwards[3] mentioned two similar cases and reviewed the embryological studies of this anomaly,[4,5] proposing the term "preaortic confluence." In 1992, Panicek et al[6] reported 2 cases of the appearance on CT of preaortic venous confluence. Because such an anterior position of IVC is typical in most marsupials, as stated by McClure and Huntington in 1929,[7] compared with the posterior position present in placental mammalians, they used the term "marsupial cava." The prevalence of this anomaly in humans cannot be predicted, but it is probably very rare because only sporadic cases are described in literature, and studies of IVC anomalies do not even cite it.[8-11]

Several common anomalies of IVC are well known to vascular surgeons (eg, left-sided IVC, duplication of IVC, circumaortic left renal vein, retroaortic left renal vein, azygos/hemizygous continuation of IVC, retrocaval ureter). Awareness of the existence of rarer anomalies is less universal, although it is sometimes equally important before procedures involving the abdominal vessels. Venous hemorrhage is the most troublesome complication during AAA surgery, occurring particularly during dissection of the proximal infrarenal aorta and the CIAs.[12] During elective surgery for AAA, the presence of this rare anomaly can be managed with little additional risk through the use of a long midline incision and transperitoneal route. With a careful blunt dissection of the right CIA bifurcation, it is possible to gain distal control without mobilizing the caval confluence, which results strictly adherent to aorta. On the contrary, this anomaly is very troublesome if the distal aorta and right CIA are approached retroperitoneally from the patient's right side. During emergency surgery, the priority of gaining quick control of the aorta and the iliac arteries through the retroperitoneal hematoma may lead to injury to major venous structures, excessive hemorrhage, and subsequent death.

Just as before elective surgery for AAA, a preoperative CT scan in stable patients with a suspected ruptured AAA is advised because such scans provide details of anomalous venous anatomy. Modern CT scanners provide a complete examination within a few minutes, and careful evaluation of the information given by the CT scan may help avoid lethal errors during surgical repair.

After this report was accepted, Ruemenapf et al[13] reported 2 other cases of preaortic iliac confluence in patients affected by abdominal aortic aneurysms.

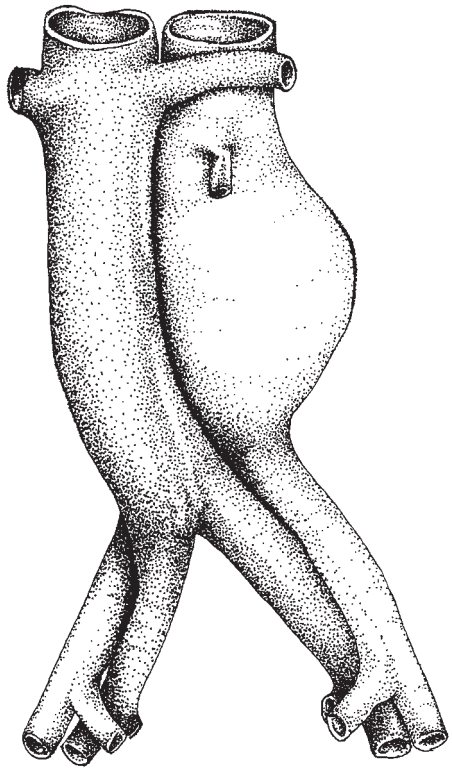

Fig 2. Anatomic relationships of marsupial cava.

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