

The Right Extra-peritoneal Approach to Abdominal Aortic Aneurysm Associated with Horseshoe Kidney and Left Sided Inferior Vena Cava

Akitoshi Kudoh, Hideaki Somura, Katsuhiko Morita, Sakurao Hiraki, Shintarou Fukuda and Nobuo Eguchi

Abstract: A clinical course of a 71-year-old man with AAA and coexistent HSK and LIVC is reported. A right extra-peritoneal exposure was performed and the whole aortoiliac system was seen directly. LIVC was placed posteriorly to AAA. The Y-Graft (UBE SHIELD GRAFT 22×11) replacement was easily replaced without resection of the isthmus of HSK. The aberrant renal artery was reimplanted to the Graft. To our knowledge, this report is the second case of AAA repaired in a patient with the coexistence of HSK and LIVC. (Jpn. J. Vasc. Surg., 12: 545-547, 2003)

Key words: Abdominal aortic aneurysm (AAA), Horseshoe kidney (HSK), Left sided inferior vena cava (LIVC), Extra-peritoneal approach, Surgical technique

Introduction

The coexistence of AAA, HSK and LIVC is rare and demands a meticulous surgical procedure. There are many technical problems related to approach, vascular access and preservation of renal isthmus. It is thought that the right extra-peritoneal approach makes an excellent exposure in this case.

Case report

A 71-year-old man was under treatment for hypertension. He had a pulsatile mass in the abdomen. He was examined by ultrasonography and was diagnosed as AAA. Subsequent CT scan, arteriography and venography confirmed a 65mm AAA with HSK and LIVC. He had taken an abdominal CT scan for abdominal pain 5years before, without detection of AAA.

Abdominal CT scan (**Fig. 1, 2**) revealed an infrarenal AAA with 64mm in its maximal diameter. The isthmus of HSK lay over the aortic bifurcation and was thick and well enhanced. So the isthmus had functioning parenchyma and the ureters were placed anteriorly. Arteriography (**Fig.3**) showed

infrarenal AAA but the aberrant renal artery was not revealed from the anterior and lateral view. Venography (**Fig. 4**) showed LIVC, which ascended along the left side of the abdominal aorta, then at the level of the diverging point from the abdominal aorta to the renal arteries, the inferior vena cava crossed over the anterior side of the abdominal aorta, positioning itself at the normal place (the right side).

According to these findings, a right extra-peritoneal approach was planned. The patient was placed in the left semilateral position, and a right paramedian skin incision was made from the lower costal margin to the lower abdomen. A right extra-peritoneal exposure was performed and the whole aortoiliac system was seen directly (**Fig. 5**). The viscera, HSK and the ureters are retracted anteriorly. The inferior mesenteric artery (IMA) was arisen from the anterior aortic surface. A small aberrant renal artery to the isthmus was noted arising from the aortic bifurcation. LIVC was placed posteriorly to AAA and was not appeared in the operative field of view. The Y-Graft (UBE SHIELD GRAFT 22×11) replacement was easily replaced without dissection of the isthmus and IMA was ligated. The isthmus was thick and well-functioning, so the aberrant renal artery was reimplanted to the Graft. Postoperative course was uneventful.

Department of Surgery, Ube Central Hospital, Ube city, Yamaguchi prefecture, Japan(Tel: 0836-51-9221)

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Fig. 1 Abdominal CT scan; Abdominal Aortic Aneurysm, Horseshoe kidney and left sided inferior vena cava was revealed.

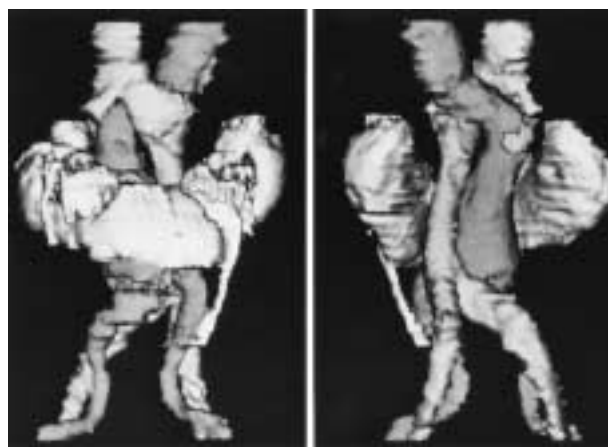


Fig. 2 3D-CT scan; a) anterior view b) posterior view

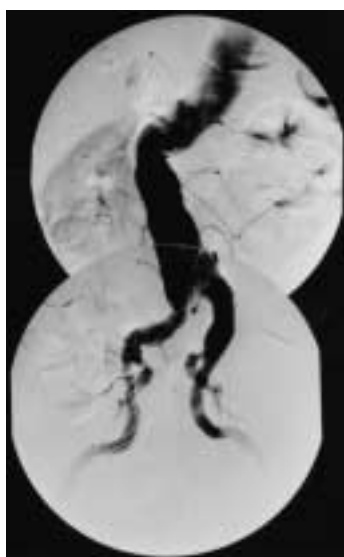


Fig. 3 Arteriography; Infrarenal Abdominal Aortic Aneurysm was revealed.



Fig. 4 Venography; Left sided inferior vena cava was revealed.

Discussion

HSK is an unusual abnormality occurring in 0.15-0.25% of the population¹⁾. The most common form fusion is between the lower poles, creating an isthmus of variable size and shape anterior to the aorta and inferior vena cava. Persistence of the left subcardinal and regression of the right subcardinal veins lead to LIVC²⁾. LIVC occurs in 0.2-0.5%. The coexistence of all three abnormalities is extremely rare. There are many technical problems related to approach, vascular access and preservation of renal isthmus in HSK and

LIVC. Generally, the isthmus of HSK is bulky and consists of parenchymatous tissue with its own blood supply and lies just below the inferior mesenteric artery at the L4 vertebral level. Division of the isthmus may increase the risk of hemorrhage and subsequent ischemia, urinary tract leakage and infection. It should be avoided whenever possible. The blood supply to the isthmus and lower poles is also very variable. Preoperative arteriography often failed to identify aberrant renal arteries. The isthmus and adjacent parenchymal masses may receive a branch from each main renal artery, or they may have their own arterial supply from the aorta, originating either above

or below the level of the isthmus. There are three common blood supplies in HSK. (a) Single renal arteries arising from the aorta. (b) Multiple aortic arteries. (c) Multiple aortic and iliac arteries¹⁾. The aberrant renal arteries should be preserved and re-implanted after the graft has been inserted, to avoid ischemia of the corresponding renal segment. The LIVC passes upward from left to right across the aorta. When the LIVC is stretched across the anterior surface of a large aneurysm, it is difficult to gain proximal control. Caval division may be necessary, but more often division of the right renal vein (medial to its tributaries) allows the LIVC to be mobi-

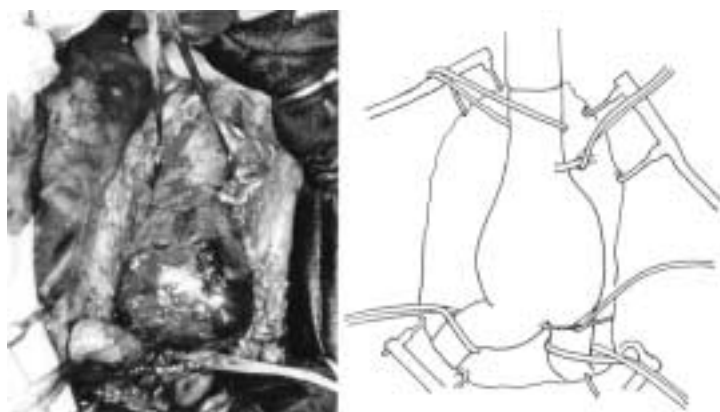


Fig. 5 Operative photography; the whole aortoiliac system was seen directly.

lized enough to proceed with the repair. The right renal vein crossing over the neck of the aneurysm is too short to retract. When the renal vein is large and crosses well above the neck of the aneurysm, division of the LIVC will allow safe and more complete exposure²⁾. The proximal anastomosis may be done cephalad to the right vein. If the LIVC does cross to the right near the upper part of the aneurysm, great care must be taken to avoid injuring it during maneuvers to isolate and cross-clamp the aorta above the aneurysmal neck³⁾.

The surgical exposure for aortic reconstruction has remained controversial. The optimal approach should provide access to the aortic neck, bifurcation and iliac arteries, and allow reimplantation of aberrant renal artery.

With the extra-peritoneal approach, the entire kidney, its collecting system and viscera are retracted anteriomedially, thus providing direct access to the abdominal aorta. The extra-peritoneal approach offers many advantages: adequate exposure to the proximal neck of AAA, reduced risk for ureteral injury, enhanced ability to endovascular reimplantation of aberrant renal artery and reduced postoperative ileus and respiratory complication, while opponents of trans-peritoneal approach argue that division of the isthmus increases the risk of urinary fistula and graft infection⁴⁾. In the case of juxtarenal AAA or the case of many aberrant renal arteries, the extra-peritoneal approach should be used.

The transperitoneal approach is the most widely used. In the majority of reports the isthmus of HSK was left intact and the graft was simply tunneled behind it. However sometimes the isthmus was divided for exposing AAA. If the renal stump

is not properly sutured, the risk of urinary fistula, followed by infection of the graft will increase.

In the right extra-peritoneal approach, LIVC didn't interfere with operative procedure because it was placed posteriorly. But the extra-peritoneal approach has also some disadvantages: difficulty in observation of colon after IMA ligation and isthmus after reimplantation of aberrant renal artery. In our opinion the right extra-peritoneal approach gives excellent exposure

to AAA associated with HSK and LIVC. In this manner, the graft can be implanted and the aberrant renal arteries can be reimplanted into the graft without damaging HSK and LIVC. For the most appropriate surgical procedure, the preoperative radiographic identification is important.

To our knowledge, this report is the second case of AAA repaired in a patient with the coexistence of HSK and LIVC⁵⁾. In the first case a transperitoneal approach was performed.

Gratitude

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