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ABDOMINAL AORTIC ANEURYSM AND HORSESHOE KIDNEY- OPEN SURGICAL REPAIR, A CASE REPORT

ANEURIZMA ABDOMINALNE AORTE I „POTKOVIČasti Bubreg“ – OTVORENI HIRURŠKI TRETMAN, PRIKAZ SLUČAJA

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Abstract

**Introduction.** Horseshoe kidney (HSK) is a congenital anomaly of the embryonic kidneys, occurs early in gestation when they are in close proximity and is the result of abnormal migration of nephrogenic cells. The presence of HSK may complicate an anterior approach to reconstructive surgery of aorta and iliac vessels, because the isthmus of the HSK lies across the aorta. HSK is often associated with anomalous renal vessels. **Case report.** We report a 71 old female patient with MDCT seen 50 mm diameter of abdominal aortic aneurysm and HSK, and aberrant renal vessels with subocluded upper left renal artery. Open surgical treatment was applied. Endarterectomy of left upper renal artery, perfusion of right common bottom pole renal artery, and reimplantation of both bottom polar renal arteries were done. Isthmus was not divided. Coexistence of HSK and abdominal aortic aneurysm (AAA) is a rare entity that presents a technical challenge to vascular surgeons because surgical treatment of such an aneurysm is complicated due to the abnormal anatomy, difficulties in exposing the aneurysm, and a variable blood supply to the isthmus and lower poles of the HSK. **Conclusion.** Open surgical repair of AAA with HSK is the successful method and provides good exposure, possibility of preserve renal circulation and prevention of renal insufficiency.

**Key words:**
abdominal aortic aneurysm, horseshoe kidney, endarterectomy, reimplantation, perfusion, renal arteries

Apstrakt

**Uvod.** Potkovičasti bubreg (PB) je urođena anomalija u embrionalnom razvoju bubrega, javlja se rano u trudnoći kada se oba bubrega nalaze u neposrednoj blizini a posledica je abnormalne migracije nefrogenih ćelija. Prisustvo PB može komplikovati anteriorni
Introduction

HSK is a congenital anomaly of the embryonic kidneys, occurs early in gestation when they are in close proximity and is the result of abnormal migration of nephrogenic cells (1). A HSK is found in approximately 0.1% of autopsy series, and in 0.1% to 0.6% of aortic operations (2). The presence of HSK may complicate an anterior approach to aorta, because the isthmus of the HSK lies across the aorta and often is associated with anomalous renal vessels (3). A medial fusion of the kidneys, mostly anteriorly to the aorta, is the main characteristic of this anomaly (4). HSK usually can be found preoperatively with MDCT angiography for abdominal aneurysm. Open surgical repair because of possible complications including renal infarction, neuralgia, and collecting system disruption presents a challenge. Endovascular aortic repair (EVAR) is considered for this pathology, allowing aneurysm repair without isthmus dissection, but, whether to sacrifice commonly presenting aberrant renal arteries during EVAR is a point of controversy. Some authors recommended a hybrid treatment. (5) We report one case of open repair AAA with HSK, with aberrant renal arteries and its reattachment without division of renal isthmus.

Case report

pristup rekonstruktivnoj hirurgiji aorte i ilijačnih arterija, jer „most“ PB leži preko aorte. PB je često povezan sa anomalijom bubrežnih sudova.

Prikaz slučaja. Žena, 71 g, primljena sa aneurizmom abdominalne aorte (AAA) prečnika 50 mm i PB, i više aberantnih bubrežnih krvnih sudova i subokludiranom levom bubrežnom arterijom vidljivo na nalazu MSCT. Operisana je klasičnom hirurškom metodom gde je urađena resekcija aneurizme sa implantacijom Dakronskog grafta bez presecanja istmsusa. Uz to je urađena endarterektomija leve gornje renalne arterije, perfuzija prave zajedničке donje polarne renalne arterije i reimplantacija obe donje polarne renalne arterije. Koegzistencija PB i AAA je retko stanje koje predstavlja tehnički izazov za vaskularnog hirurga zbog abnormalne anatomijske, težeg prilaza aneurizmi i varijabilne vaskularizacije bubrega a posebno istmsusa.

Zaključak. Otvorena hirurška metoda lečenja AAA sa PB je uspešna i pruža dobar pristup aneurizmi i sudovima, mogućnost očuvanja bubrežne cirkulacije a time i sprečavanje bubrežne insuficijencije.
A 71 old female patient was admitted to our hospital with MDCT finding of 50 mm wide AAA and HSK. Isthmus of HSK was on the front side of aneurysm. Fig. 1. Near here

Fig. 1 – AAA and HSK.

Patient was asymptomatic for abdominal pain, and have no urinary tract symptoms. Values of urea and creatinine were mildly elevated (Urea 13,5 IU/L and Creatinine 168 IU/L). On MDCT analysis renal vessels it was seen that left renal vein was in preaortic position. Right and left upper polar renal artery had originate from healthy part of abdominal aorta, but left upper polar renal artery was subocluded at the exit of aorta. Right and left lower polar renal artery had originate from aneurysm. Right lower polar renal artery had a two branches: one for lower pole of right kidney, and left branch for lower pole of left kidney. Fig. 2. Near here
Operation was performed into general endotracheal anaesthesia with monitoring of arterial tension, diuresis, gas analyses, ECG and pulse oxymetry. After medial laparotomy all arteries were located. Artery for upper pole of both kidneys, artery for lower pole of left kidney 3 mm in diameter, common artery for lower pole of both kidneys 5 mm in diameter. Fig 3. Near here

Fig. 2 – Aberrant renal arteries.

Fig. 3 – Left renal vein, left superior renal artery (suboccluded), bottom pole renal arteries and isthmus of HSK (blue tape).
Left urether follows isthmus of HSK. Artery for right urether that was originate from right common iliac artery. Figure 4. Near here

![Image of AAA with HSK, bottom polar renal arteries, left urether, isthmus of HSK (blue tape), and artery for right urether.](image)

**Fig. 4** – AAA with HSK. Bottom polar renal arteries, left urether, isthmus of HSK (blue tape), and artery for right urether.

Patient was heparinised, aorta was clamped in suprarenal position. After aneurysm was opened, common artery for lower poles of kidney was perfunded with NaCl, sol. 0,9%. Endarterectomy of left renal artery for upper pole was done. After that, proximal anastomosis of graft and aorta under renal arteries for upper pole was made with Vascutec vascular graft 18 mm. After we finished the anastomosis, clamp were moved distally and time of suprarenal clamping of aorta was 22 minutes. In plane between aneurism and HSK bridge we made some space by tunnelling and graft was pull through in between. Than, distal T-T anastomosis between graft and aorta was done and declamped. Common renal artery for lower pole of both kidneys was reattached also as the left inferior polar renal artery. Figure 5. Near here
Fig. 5 – Reconstructed aorta with graft pull through beneath kidney bridge and reattached bottom polar renal arteries.

Aorta were clamped for 51 minutes, and renal perfusion lasts for 46 min. Diuresis after declamping and renal arteries reimplantation was 100 ml in a first hour. After control of hemostasis we closed retroperitoneum and abdominal wall. Postoperatively in the intensive care unit patient had a diuresis 2600ml for a first day. Pulses were palpable and arterial pressure was between 100-140/70-100 mmHg. The second postoperative day urea was 13,5 IU/L and creatinine 168 IU/L. Third postoperative day creatinine was 180 IU/L. Patient treated with intensive saline therapy and diuretics and after one day values of urea and creatinine fall down (10,5 IU/L, and 150 IU/L). Peristaltic was established in the second postoperative day, and normalised in the next two days with a diet. Patient was discharged 8th postoperative day.

Discussion

Coexistence of HSK and AAA is a rare entity that presents a technical challenge to vascular surgeons because surgical treatment of such an aneurysm is complicated due to the abnormal anatomy, difficulties in exposing the aneurysm, and a variable blood supply to the isthmus and lower poles of the HSK.(6) Abnormalities concerning the number and the origin of kidney vessels can be associated to ectopic and HSK. (7) Appropriate preoperative evaluation of the HSK by CT-angiography and renal function is mandatory.
for optimal planning of the treatment strategy (8). Horseshoe kidneys are frequently found in patients with other venous, and particularly inferior vena cava anomalies, which should be evaluated using MDCT as part of treatment planning (9). Transperitoneal approach provides the best exposure to the aneurysm and kidney, however, the presence of the renal isthmus affects both surgical exposure and proximal aortic control. Left retroperitoneal approach has the advantage of avoiding interference with the renal isthmus and urinary tracts; however, access to the right iliac artery is limited (10). Division of the renal isthmus can be associated with increased risk of retroperitoneal urinary leaks, bleeding, infection and renal ischemia (6). Davidovic et all. in their study on 25 patients with HSK who underwent aortic surgery, in 18 cases kidney tissue transection was successfully avoided with vascular graft placement beneath the bridge of HSK. In 12 cases with detected anomalous renal arteries, their reattachment into vascular graft has been performed (4) Defined guidelines for the management of accessory renal arteries have yet to be established, minimizing the risk of renal insufficiency and renal vascular hypertension is the ultimate goal. Individualizing the management of accessory renal arteries is necessary.(11) Kaplan et all. noted that accessory vessels over 3 mm in diameter should be reattached to reduce the risk of postoperative renal insufficiency.(12) Newest reports (5,11) reported a cases in which hybrid surgical repair was performed for AAA in a patient with HSK and aberrant renal vasculature including EVAR after debranching of aberrant renal arteries. EVAR is regarded as a valuable alternative to open surgical therapy, in the absence of renal failure and provided that accessory renal arteries are absent or small. (8) In our case we had initial level of renal failure, and big accessory renal arteries they were originated from aneurysm. Superior left renal artery was subocluded and it need endarterectomy. Customized endografts are a viable tool to preserve aberrant vessels and thus renal mass in AAA and HSK. Customized endografts require an extensive work-up and are currently expensive to fabricate. (13)

**Conclusion**

Open surgical repair of AAA with HSK is the successful method for experienced team and provides good exposure of aorta, kidneys, and vessels. Endarterectomy of renal arteries, reimplantation of accessory renal vessels, and preservation of isthmus of HSK is the challenge but best choice to prevent postoperative renal insufficiency.
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