CASE REPORT

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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

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Abstract

Introduction. Horseshoe kidney (HSK) is a congenital anomaly of embryonic kidneys, which occurs in early gestation when both kidneys are in close proximity. This happens as a result of abnormal migration of nephrogenic cells. The presence of HSK may complicate an anterior approach to reconstructive surgery of the aorta and iliac vessels because the isthmus of the HSK lies across the aorta. HSK is often associated with anomalous renal vessels. **Case report**. A 71-year-old female patient was admitted with an abdominal aortic aneurysm, 50 mm in diameter, and HSK, and multiple aberrant renal vessels with subocluded upper left renal artery as seen on the multidetector computed tomography (MDCT). Open surgical treatment was applied. Endarterectomy of the left upper renal artery, perfusion of the right common bottom pole renal artery, and reimplantation of both bottom polar renal arteries were done. Isthmus was not divided. The coexistence of HSK and abdominal aortic aneurysm (AAA) is a rare condition. It presents a technical challenge to vascular surgeons because the 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 a successful method and provides good exposure, the possibility of renal circulation preservation, and prevention of renal insufficiency.

Key words:
fused kidney; aortic aneurysm, abdominal; surgical procedures, operative; endarterectomy; reperfusion.

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 pristup rekonstruktivnoj hirurgiji aorte i ilijačnih arterija, jer „most“ PB leži preko aorte. PB je često povezan sa anomalijom bubrežnih sudova. **Prikaz bolesnika.** Žena, stara 71 godinu, primljena je sa aneurizmom abdominalne aorte (AAA) prečnika 50 mm i PB, i više aberantnih bubrežnih krvnih sudova i subokludiranom levom bubrežnom arterijom vidljivom na nalazu multislajsne kompjuterizovane tomografije (MSCT). Operisana je klasičnom hirurškom metodom gde je urađena resekcija aneurizme sa implantacijom Dakronskog grafta bez presecanja istmusa. Pored toga, urađena je endarterektomija leve gornje renalne arterije, perfuzija prave zajedničke donje polarne renalne arterije i reimplantacija obe donje polarne renalne arterije. Koegzistencija PB i AAA retko je stanje koje predstavlja tehnički izazov za vaskularnog hirurga zbog abnormalne anatomije, težeg prilaza aneurizmi i varijabilne vaskularizacije bubrega, a posebno istmusa. **Zaključak.** Otvorena hirurška metoda lečenja AAA sa PB predstvlja uspešan način rešavanja ovog problema jer pruža dobar pristup aneurizmi i renalnim krvnim sudovima uz mogućnost očuvanja bubrežne cirkulacije i, posledično, sprečavanja bubrežne insuficijencije.

Ključne reči:
bubreg, potkovičasti; aorta, abdominalna, aneurizma; hirurgija, operativne porocedure; endarterektomija; reperfuzija.

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Introduction

HSK is a congenital anomaly of embryonic kidneys, which occurs in early gestation when both kidneys are in close proximity. This happens as a result of abnormal migration of nephrogenic cells [1]. The HSK is found in approximately 0.1% of autopsy results and 0.1% to 0.6% of aortic operations [2]. The presence of HSK may complicate an anterior approach to the aorta because the isthmus of the HSK lies across the aorta and is often 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]. The HSK can be usually found preoperatively with multidetector computed tomography (MDCT) angiography of the abdominal aneurysm. Open surgical repair presents a challenge because of the possible complications including renal infarction, neuralgia, and collecting system disruption. Endovascular aortic repair (EVAR) is considered for this pathology, allowing aneurysm repair without isthmus dissection. However, 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 dividing the renal isthmus.

Case report

A 71-year-old female patient was admitted to our hospital with an MDCT finding of 50 mm wide AAA and HSK. The isthmus of HSK was on the front side of the aneurysm (Figure 1).

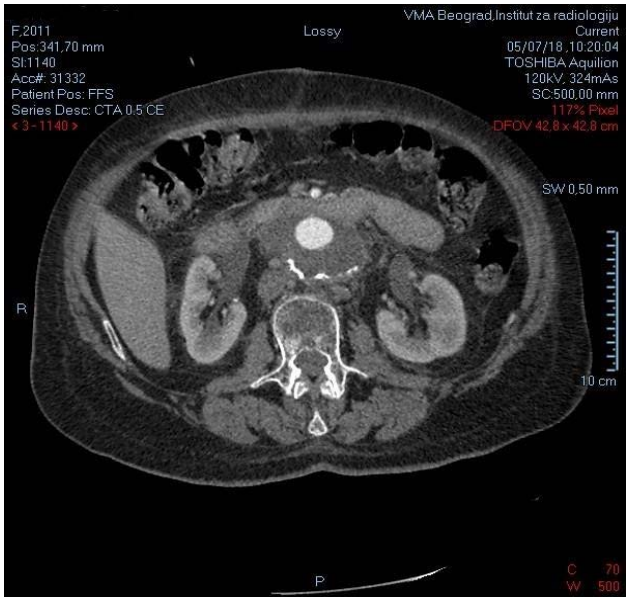

Fig. 1 – Abdominal aortic aneurysm (AAA) and horseshoe kidney (HSK).

The patient was asymptomatic for abdominal pain and had no urinary tract symptoms. Values of urea and creatinine were mildly elevated (Urea 13.5 IU/L and Creatinine 168 IU/L). On the MDCT analysis of renal vessels, it was seen that the left renal vein was in a preaortic position. The right and left upper polar renal artery originated from the healthy part of the abdominal aorta, but the left upper polar renal artery was subocluded at the exit of the aorta. The right and left lower polar renal artery originated from an aneurysm. The right lower polar renal artery had two branches: the right branch for the lower pole of the right kidney and the left branch for the lower pole of the left kidney (Figure 2).

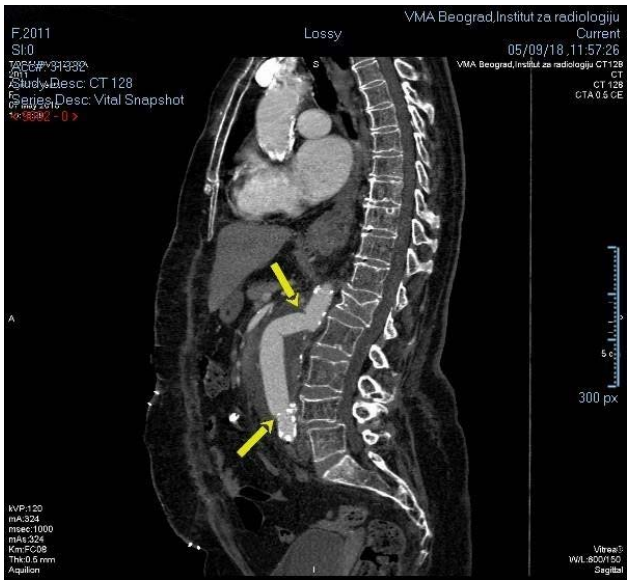

Fig. 2 – Aberrant renal arteries.

The operation was performed under general endotracheal anaesthesia with the monitoring of arterial tension, diuresis, gas analyses, electrocardiography, and pulse oxymetry. After medial laparotomy, all arteries were located. The arteries located are the following: artery for the upper pole of both kidneys, artery for the lower pole of the left kidney, 3 mm in diameter, and a common artery for the lower pole of both kidneys, 5 mm in diameter (Figure 3).

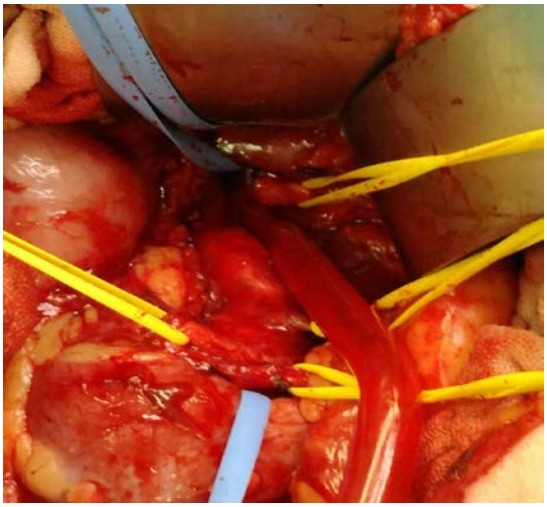

Fig. 3 – Left renal vein, left superior renal artery (subocluded), bottom pole renal arteries and isthmus of horseshoe kidney (blue tape).

The left ureter followed the isthmus of HSK. The artery for the right ureter originated from the right common iliac artery (Figure 4). Reconstructed aorta with graft pull-through beneath the kidney bridge is shown in Figure 5.

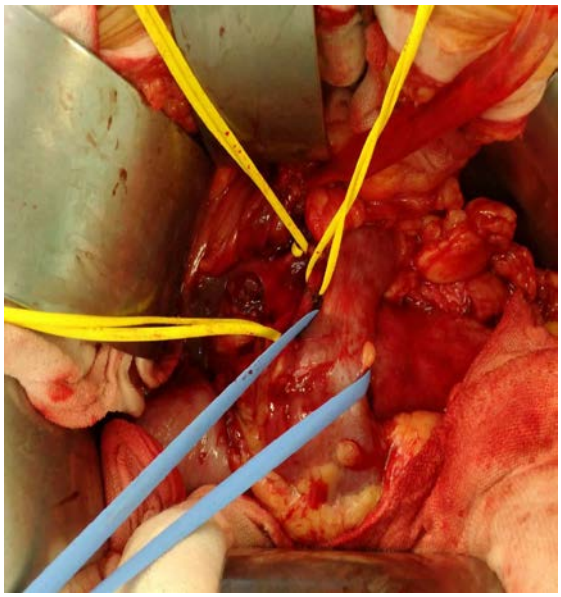

Fig. 4 – Abdominal aortic aneurysm (AAA) with horseshoe kidney (HSK). Bottom polar renal arteries, left ureter, isthmus of HSK (blue tape), and artery for right ureter.

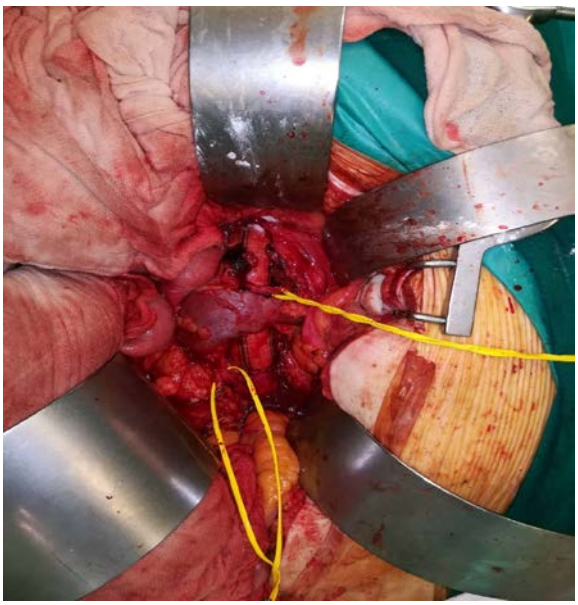

Fig. 5 – Reconstructed aorta with graft pull-through beneath the kidney bridge and reattached bottom polar renal arteries.

The aorta was clamped for 51 minutes, and the renal perfusion lasted for 46 min. Diuresis after declamping and reimplantation of renal arteries was 100 mL in the first hour. After control of hemostasis, we closed the retroperitoneum and the abdominal wall. In the Intensive care unit, the patient had a diuresis of 2600 mL postoperatively on the first day. Pulses were palpable and arterial pressure was between 100–140/70–100 mmHg. On the second postoperative day, urea was 13.5 IU/L and creatinine 168 IU/L. On the third postoperative day, creatinine was 180 IU/L. The patient was given intensive saline therapy and diuretics, and after one day, the values of urea and creatinine decreased (10.5 IU/L and 150 IU/L). Peristalsis was established on the second postoperative day and normalized in the next two days with a diet. The patient was discharged on the 8th postoperative day.

Discussion

The coexistence of the HSK and AAA is a rare condition that presents a technical challenge to vascular surgeons because the 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 the lower poles of the HSK [6]. Abnormalities concerning the number and the origin of kidney vessels can be associated with ectopic kidney and HSK [7]. An appropriate preoperative evaluation of the HSK by computed tomography (CT)–angiography and the 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 a part of treatment planning [9]. The 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. The left retroperitoneal approach has the advantage of avoiding interference with the renal isthmus and urinary tract; however, access to the right iliac artery is limited [10]. Division of the renal isthmus can be associated with an increased risk of retroperitoneal urinary leaks, bleeding, infection, and renal ischemia [6]. In the study by Davidović et al. [4], 25 patients with HSK underwent aortic surgery; in 18 cases, kidney tissue transection was successfully avoided by placing vascular grafts beneath the bridge of the HSK. In 12 cases, anomalous renal arteries were detected, and their reattachment into vascular graft has been performed. Defined guidelines for managing 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 al. [12] noted that accessory vessels over 3 mm in diameter should be reattached in order to reduce the risk of postoperative renal insufficiency. The newest reports [5, 11] demonstrated cases in which hybrid surgical repair was performed for AAA in a patient with HSK and aberrant renal vasculature, including EVAR after debranching aberrant renal arteries. EVAR is regarded as a valuable alternative to open surgical therapy in the absence of renal failure, provided that accessory renal arteries are absent or small [8]. In our case, we had the initial level of renal failure and big accessory renal arteries that originated from an aneurysm. The superior left renal artery was subocluded, and endarterectomy was necessary. Customized endografts are a viable tool for preserving aberrant vessels and the 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 a successful method for an experienced team and provides good exposure of the aorta, kidneys, and vessels. Endarterectomy of renal arteries, reimplantation of accessory renal vessels, and preservation of isthmus of HSK represents a challenge, but it is also the best choice for preventing postoperative renal insufficiency.

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