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Case report

Association of Autosomal Dominant Polycystic Kidney Disease and Abdominal Aortic Aneurysm - A Case Report

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Abstract

Introduction. Autosomal dominant polycystic kidney disease (ADPKD) is a systemic disease with multiple cysts in several organs. Formation of aneurysms of: the aorta, coronary and cerebral arteries are increasingly reported in the literature as extra-renal manifestations.

Case report. We report a 77-year-old male with ADPKD and long-standing hypertension, admitted to our ward due to an extreme weakness, malaise and abdominal pain with severe anemia and elevated serum levels of creatinine and urea. The treatment with hemodialysis and blood substitution was initiated. Abdominal echo-sonography showed hepatic cysts and polycystic kidneys. The cysts were filled with a clear content, in the right kidney toward the upper pole, two larger cysts were noted and an adjacent pulsatile cystic lesion with a hemorrhagically-filled content, highly suspicious for an aneurismatically dilated abdominal aorta. CT angiography of the aorta showed dilated, tortuous aorta with advanced atherosclerosis along its entire length. The dilatation was evident in the descending part of the aorta, with an infrarenal saccular dilatation before the bifurcation, that seemed to be thrombosed and a denser content was observed next to it, probably an older hemorrhagy, without imaging signs of acute extravasation of the contrast. Cardiovascular surgeon recommended coronography and coronary artery aneurisms were excluded. Unfortunately, the patient started to alternate with his consciousness and brain CT angiography showed corticoreductive changes, without any aneurism, or extra-or intra-axial hemorrhage. Due to the severe general condition, clinical assessment and advanced age of the patient, the case was declared as inoperable.

Conclusion. Due to a hypertension and associated connective tissue disorders patients with ADPKD are prone to develop aortic aneurysms, that should be questioned as a frequent feature in such patients. Hence, an early diagnosis and treatment decision based on a risk-benefit analysis, remain the cornerstone of management.

Keywords: Autosomal dominant polycystic kidney disease, arterial hypertension, abdominal aortic aneurysm

Introduction

Autosomal dominant polycystic kidney disease (ADPKD) is a genetic, progressive, systemic disease characterrized by the formation and growth of cysts primarily in the kidneys and other organs such as liver, pancreas and spleen, leading to an kidney enlargement and often progressive loss of renal function [1]. Another extra-renal maknifestations associated with this condition that are increasingly reported in the literature are: formation of aneurysms of the aorta, coronary and cerebral arteries [2,3].

The exact mechanisms underlying the association between ADPKD and aortic aneurysms are not fully understood, but it is believed to involve mutations in one of two genes PKD1 and PKD2, which encode polycystin-1 and -2, respectively. These proteins that contribute to the integrity of blood vessel walls are expressed in smooth muscle cells and myofibroblasts of the tunica media and in the endothelial layer of vessels, so that when they are mutated, they lead to abnormalities in connective tissue proteins, such as collagen, causing vascular wall weakness and formation of aneurysms [4].

The signs and symptoms of ADPKD can vary greatly from person to person and can range from mild to severe. Here are some common signs and symptoms associated with ADPKD: abdominal pain, hypertension, urinary tract infections, gross hematuria and nephrolithiasis. Hypertension is considered to be one of the most common early signs of ADPKD and it occurs in 50-75% of the patients, prior to loss of kidney function [5]. There are two main assumptions about the cause of hypertension in ADPKD: a primary vasculopathy secondary to mutations in the PKD1 and PKD2 genes

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that encode polycystine; and secondary to activation of the rennin-angiotensin-aldosterone system by cyst expansion and intrarenal ischemia. Which mechanism prevails, remains unknown [6].

Case report

We report a 77-year-old male with ADPKD and long-standing hypertension, with poor blood pressure control, admitted to our ward due to an extreme weakness, malaise and abdominal pain. Laboratory findings showed anemia with haemoglobin levels 65g/l and an elevated serum levels of creatinine 514 umol/L, urea 41 mmol/l, with elevated inflammatory markers C-reactive protein (CRP) 251 mg/l and leukocytosis $26x10^9$ /l. Treatments with hemodialysis and blood substitution were started, simultaneously administering a double, parenteral antibiotic. Abdominal echo-sonography showed hepatic cysts and polycystic kidneys. The cysts were fulfilled with a clear content, in the right kidney toward the upper pole, two larger cysts were noted and an adjacent pulsatile cystic lesion with hemorrhagically-filled content highly suspicious for an aneurismatically dilated abdominal aorta. The echo- cardiography showed: dilated aortic bulbus diameter 34 mm, arcus aortae dimensions- 25mm, descending aorta at left ventricle (LV) level with diameter 41mm. At 10 cm above the umbilicus, dilatation of the abdominal aorta was noticed, with maximum dimensions of 51x56 mm, and thrombosed section in the lumen with a dimension of 21-23 mm, with signs for recanalization. Aortic cusps were atheromatously changed, with normal function. Mild mitral and tricuspid regurgitation was present, without hemodynamic significance. Dimensions of the left cavities were slightly enlarged, with a moderate reduction of the global LV systolic function, and an ejection fraction (EF) of 48%, impaired diastolic function and a worsened LV relaxation (E/e 9.87). Computed tomography angiography (CTA) of the thoracic and abdominal aorta showed dilated, tortuous aorta with advanced atherosclerosis and significant atheromatous plaques presenting in concentric form, and a mixed character of calcifying plaques and intramural hematomas almost along its entire length (Figure 1 and 2). The dilatation was evident at the level of the descendenting aorta with diameter: 46 mm, thoracic aorta with diameter: 60 mm and aneurismatically expanded infrarenal aorta with diameter: 58 mm (Figure 3, 4 and 5). Infra- renal, at the level just before the bifurcation of the common iliac artery, a larger saccular aortic aneurysm with dimensions: cranio- caudal (CC)-8.5cm, latero- lateral (LL)-8.4cm and anterio- posterior(AP) - 10.5cm was observed, filled-up with a denser content and different zones of hemorrhage in organization. (Figure 6 and 7) Marked green arrows on (Figure 8) showed an anterior part around the aneurysm with a denser liquid collection highly suspicious for hemorrhage in organization and no signs of an active extravasation of the contrast.

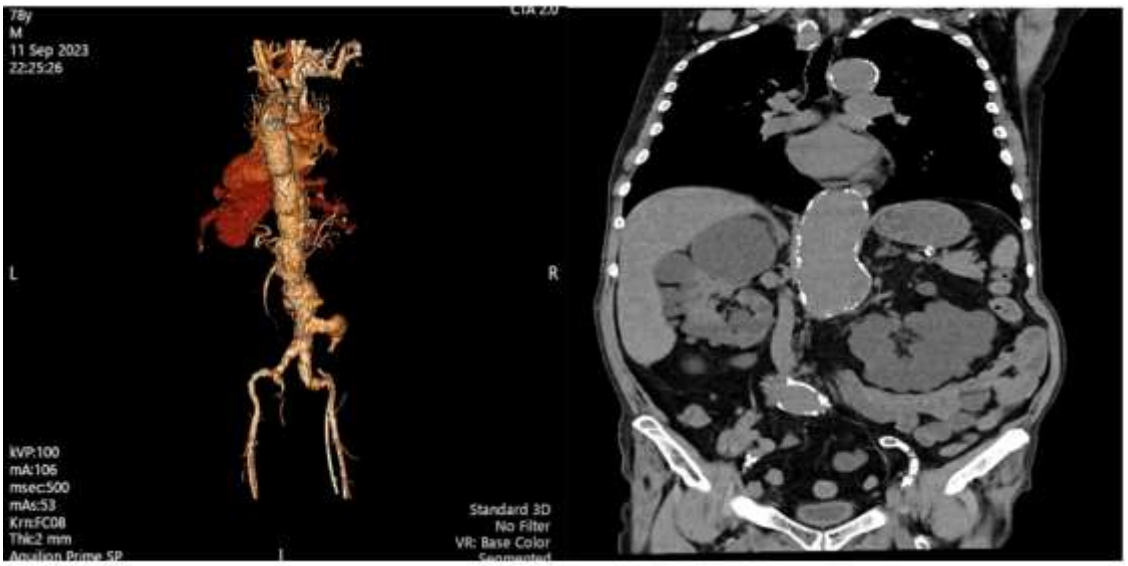

Fig. 1. and Fig. 2. Computed tomography angiography (CTA) of the thoracic and abdominal aorta showing dilated, tortuous aorta with advanced atherosclerosis along and significant atheromatous plaques, presenting in concentric form and mixed caracter of calcifying plaques and intramural hematomas almost along its entire length.

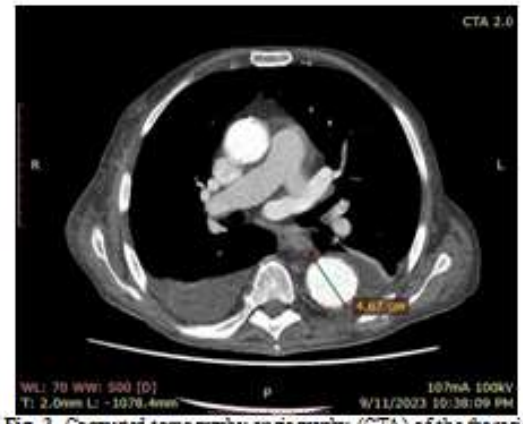

Fig. 3. Computed tomography angiography (CTA) of the thoracic aorta showing aneurismatically expanded descending aorta with diameter: 46 mm.

Fig. 4. Computed tomography angiography (CTA) of the thoracic aorta showing aneurismatically expanded thoracic aorta with diameter: 60 mm.

Fig. 5. Computed tomography angiography (CTA) of the aorta showing aneurismatically expanded infrarenal aorta with diameter: 58 mm.

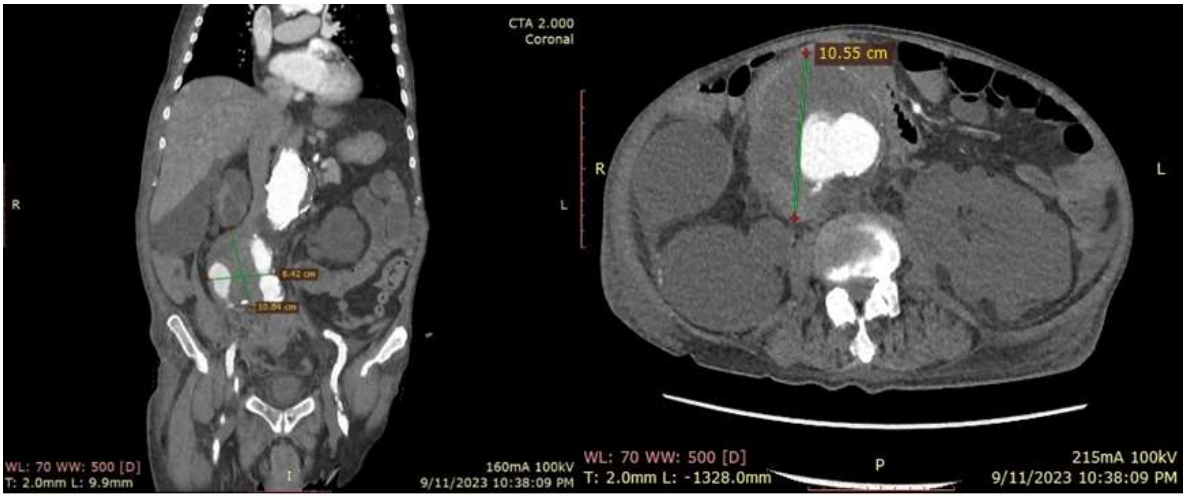

Fig. 6. and Fig. 7. Computed tomography angiography (CTA) of the abdominal aorta showing just before the bifurcation of the common iliac artery, a larger saccular aneurysm with dimensions CC - 8.5cm, LL - 8.4cm and AP - 10.5cm, filled with a denser content and different zones of hemorrhage in organisation.

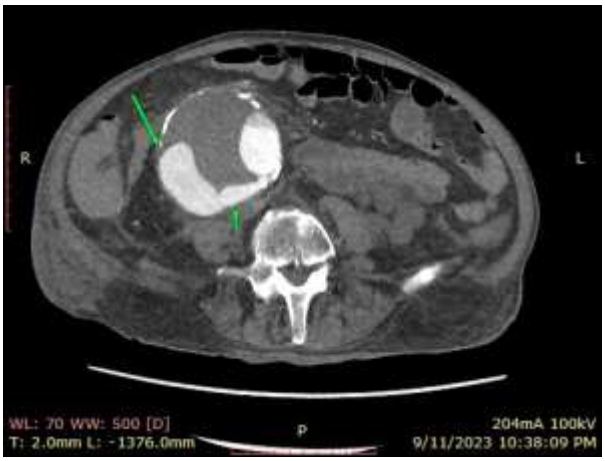

Fig. 8. Computed tomography angiography (CTA) of the abdominal aorta: green arrows showing anteriorly around the aneurysm a denser liquid collection highly suspicious for hemorrhage in organization and no signs of an active extravasation of the contrast.

The cardiovascular surgeon recommended coronary angiography and the finding was with plaques on the RCA and LAD, excluding coronary artery aneurisms. Unfortunately, the patient started to alternate with his consciousness and the brain CT angiography showed corticoreductive changes, without an aneurysm, or extra-or intra-axial hemorrhage. Due to the severe general condition, clinical assessment and advanced age of the patient, the case was declared as inoperable.

Discussion

Multiple renal and extra- renal cystic formation and growth is the core feature of ADPKD, due to the hereditary disruption of the PKD1 and PKD2 genes, resulting in a disturbance of the structure of polycystin 1 and polycystin 2 proteins in vascular smooth muscle, which in return causes further expansion of the vascular architecture and ultimately leads to extensive thoracic and abdominal aneurysm formation [7].

Original Ravine PKD1 diagnostic Criteria are: two or more cysts, unilateral or bilateral at the age from 15 to 29 years, two or more cysts in each kidney at the age of 30 to 59 years and four or more cysts in each kidney at the age of 60 years or older. These criteria are less accurate for diagnosing PKD2, and two notable characteristics are: Three or more total cysts in those aged 15 to 39 years have a positive predictive value of 100%, two or fewer cysts in those older than 40 years have a negative predictive value of 100% [8].

Due to the history of previous myocardial infarction and implanted coronary stent to RCA, coronary angiography was indicated to rule out an aneurysm dilatation of the coronary vessels. Neves *et al*., showed in their systematic review that 6 out of 23 patients with ADPKD (40%) had multiple coronary aneurysms, which is why this complication should be considered more often, although in the general population their occurrence is rare [9]. Jiang *et al*., in their systematic review reported that out of 76 patients with CAA, 3% of cases described the etiology of the aneurysm as ADPKD [3].

The most dramatic cardiovascular complication in patients with ADPKD is the rupture of an intracranial aneurysm (ICA). A family history of ICA rupture was a significant predictor identified in a retrospective study of 608 adults from 199 ADPKD families [10]. Due to a sudden alteration in level of the consciousness and movement difficulties in our case, a neurologist and psychiatrist were consulted, CTA of the brain was performed and corticoreductive changes were noted, without an aneurysm or an extra- or intraaxial bleeding. Kataoka *et al*., study showed that ICA in patients with ADPKD were associated with general risk factors such as: female sex, increased age, subarachnoid hemorrhage (SAH) history, but also with declining kidney function and increased kidney volume. The factors observed to be associated with ICA may contribute to an effective ICA screening and treatment planning in patients with ADPKD [11].

According to the National Institute for Health and Care Excellence (NICE) recommendations, all men aged 66 or more and women aged 70 or more should be screened especially for abdominal aortic aneurysm (AAA) if they have one of the risk factors such as: COPD, coronary, cerebrovascular or peripheral arterial disease, family history of AAA, hyperlipidemia, they smoke or used to smoke, including hypertension [12].

Another cohort study of Sung PH *et al*., concluded that ADPKD is a risk factor for developing AA and aortic aneurysm dissection (AAD), and hypertension, advanced age, and male gender were mentioned as independent risk factors for developing AA/AAD in ADPKD. Also, the ADPKD patients had more comorbidities than the general population, and those patients with coexistence of ADPKD and hypertension had much higher risk to develop AAD in the future [13]. Therefore, a strict blood pressure control in ADPKD patients is considered to be an important clinical issue for prevention of any vascular complication, especially for AA/AAD. This concept is also supported by current available consensus guidelines for most patients with ADPKD, with the goal of blood pressure to be at 120 to 125/<80 mmHg-using the non-routine [preferred] measurement methods including standardized office blood pressure monitoring (OBPM), home blood pressure monitoring (HBPM), and daytime ambulatory blood pressure monitoring (ABPM) or 125 to 130/<80 mmHg (using routine OBPM) [14].

According to NICE recommendations, aneurysm repair is considered for people with an unruptured AAA in case of symptomatic aneurysm, asymptomatic and larger than 4.0 cm with a growth by more than 1 cm in 1 year, or asymptomatic measuring ≥5.5 cm [12]. Our case was declared to be inoperable due to a severe ge-

neral condition, the clinical assessment and the advanced age of the patient.

Conclusion

Due to a hypertension and associated connective tissue disorders patients with ADPKD are prone to develop aortic aneurysms, that should be questioned as a frequent feature in such patients. A careful preventive monitorring with periodic clinical and ultrasound check-up, as well as a rigorous BP control could reduce the risk of AA and improve the outcome of these patients, hence early diagnosis and treatment decisions based on a risk-benefit analysis, remain the cornerstone of the management.

Conflict of interest statement. None declared.

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