COMPLEMENTARY ROLE OF DIAGNOSTIC IMAGING IN SEVERE RENOVASCULAR ARTERIAL HYPERTENSION IN YOUNG PATIENTS

IOAN OSWALD¹, ELISABETA ANTONESCU², CAMELIA MRAZ³, ANGELA ANTONESCU⁴, ALINA VENTER²

¹²³⁴“University of Oradea, ²”Lucian Blaga” University of Sibiu

Keywords: renovascular, renal artery stenosis, renal artery anomaly, left ventricular hypertrophy, left ventricular diastolic dysfunction

Abstract: Renal artery stenosis represents the most frequent cause of secondary arterial hypertension. The atherosclerotic disease, which mainly affects all the proximal third of the main artery, is encountered mostly in the elders. The fibromuscular dysplasia affects most of all the distal two-thirds and the renal arteries branches and is met mostly in young women. The renovascular disease is an important and most of the time unknown cause of renal insufficiency, refractory hypertension and global cardiovascular mortality. As long as the severe renal artery disease can cause renal dysfunction, the identification and the treatment of important renal artery stenoses can have major benefits on the state of health. We present an interesting case that falls into this pathology encountered in our medical practice. There are multiple particularities of the case: the appearance of a severe hypertension (Systolic TA over 260mmHg, diastolic BP over 150mmHg) in a 19 year-old male patient, absence of symptoms, renal arteries anomaly, concordances and discordances of the imagistic investigations, early appearance of complications of the arterial hypertension, and of the left ventricular hypertrophy and left ventricle diastolic dysfunction, respectively; the association at the hypertensive cardiopathy of the ventricular septal defect of and the basal interventricular septal aneurysm.

INTRODUCTION

The renovascular hypertension (RVHT) is one of the most common forms of secondary hypertension and it is not easy to be recognized.(6) The prevalence of the renovascular hypertension in the entire hypertensive population varies between 1-5% according to different studies.(7) The diagnosis of renovascular AHT can be suggested by the association of some symptoms and clinical signs, among which the most important are the severe AHT onset in young people or people over 50, the pain and the lumbar murmurs appeared in the context of a AHT and the rapid deterioration of the renal function in a hypertensive person.(1) The RVHT etiology contains various anatomic entities that can be classified in two major types that appear at different ages and affect both sexes differently.

The stenosed injuries of atherosclerotic nature are more frequent (65%) and they appear in persons over 45 years old, more frequently in men (some are diabetic and smoking persons) with a proximal localization (the first 2 cm) at the renal artery and with tendency to occlusion in 50% of the patients. The stenoses produced by the fibromuscular dysplasia appear very often in persons under 30 years old, frequently in women, spotted in the medium and distal third, often unilateral and with a progression accompanied by complications such as thrombosis and dissections. There are three forms of fibromuscular dysplasia: intimal, medial and periarterial.

The pathogenic mechanism of the renovascular AHT, identified experimentally by Goldblatt even since 1934, represents the prototype of the ischemic and activation mechanism of the renin-angiotensin system.
CASE REPORT

19 year-old patient, P.T., male, from the countryside, at a routine control was diagnosed with very high TA values, 260/155mmHg. The patient presented only a mild asthenia and intolerance at big efforts. He did considered himself hypertensive, he did not follow any treatment, did not have chronic affections and he was an active person and overweight. On examination with the cardiovascular device, along the TA high values, there can be seen a systolic breath 2/6 at the apex and the cord base.

The usual laboratory examinations were within normal limits. ECG: SR = sinus rhythm, AV ≈ 80b/min, LVH without modifications ST-T. On the echocardiography it is seen: concentric left ventricular hypertrophy, efficient left ventricle, (FE > 65%) (figures no. 1, 2, 3), pseudo normal diastolic dysfunction (figure no. 4) (transmittal flow E/A > 1, that becomes under unitary at the Valsalva manoeuvre, pulmonary venous flow with S/D < 1, atrium reflow AR > 35cm/s).

Figure no. 1. PSLA Section (parasternal long axis): concentric left ventricular hypertrophy

Figure no. 2. PSLA Section: concentric LVH; LV in the left systole, LV in the right diastole

Figure no. 3. PSLA Section, mode M: concentric LVH, efficient LV, FE > 60%

Regarding the diastolic function we have to specify that, when the transmittal flow is super unitary (E/A > 1), in the presence of the ventricular hypertrophy, we have to differentiate the normal aspect from the pseudo normal diastolic dysfunction, using additional technologies (Valsalva, pulmonary venous flow, tissue Doppler, the propagation speed of the flow in VS through colour M mode). Further, the isovolumic relaxation time (IVRT) is slightly diminished (60ms) and the deceleration time of the E-wave is at the inferior limit (TDE = 150 ms).

Figure no. 4. PSLA Section, pulsed Doppler interrogation of the transmittal flow: pseudo normal diastolic dysfunction (IVR=60ms, TDE=150ms), confirmed by the Valsalva manoeuvre and DP in the superior right pulmonary vein

At the cardio echography, we can also observe: significant basal IVS aneurysm and insignificant hemodynamic restrictive subvalvular aortic VSD, minor mitral insufficiency, 1st degree aortic failure. At the abdominal echography we can observe a slight hepatic steatosis, normal kidneys, steady parenchymatous coefficient, and slight dimensional asymmetry between the two kidneys. Considering the severe hypertension and the age of the patient, we apply the Doppler echography of the renal arteries. The examination is difficult because the patient is obese, with accentuated meteorism. We can succeed in relieving very high velocities of the sanguine flow at the level of the right renal artery. It is recommended the CT-angiography examination of the renal vessels, which confirms the right renal artery failure question, with filling deficiency of the entire primitive tract, but without the clear prominence of a stenosis area. On the left side – there can be seen a vascular anomaly with two renal arteries that have independent origin from aorta at the same level. Furthermore, the aspect of the aortic tract and main branches is normal. The renal artery modifications observed at the CT-angiography sustain the angiography indication. Due to administrative reasons, this examination was postponed. The patient begins the treatment, initially with a converting enzyme inhibitor associated with a selective beta-blocker. Because the arterial pressure has high values, a calcium blocker is added at the treatment, thus obtaining normal TA values, approximately 140/90 mmHg. Clinically, the patient’s evolution is good, the patient being asymptomatic. In order to exclude other secondary AHT reasons we make additional laboratory examinations: vanillyl mandelic acid measuring in the 24-hour urine to exclude the pheochromocytoma, urinary and plasmatic potassium measuring to exclude the hyperaldosteronism determination of the serum cortisol concentration to exclude the Cushing’s syndrome. All these examinations were made within normal limits.

We can observe during the repeated Doppler exam of the renal arteries a particular aspect of the flow in the right renal artery. In the proximal segment, the Doppler recording of the sanguine flow has almost a normal aspect (figure no. 5).

In these conditions, the established conditions for the echographic definition of the renal artery stenosis are missing, meaning systolic speed > 180cm/s with RAR > 3,5 (proportion between the systolic speeds in the renal artery and the aorta) but the criteria for the appreciation in the hilum of the renal artery stenosis are present: acceleration time > 100msec, acceleration coefficient (dV/dT) < 291cm/s, „tardus et parvus” profile, meaning the absence of the early systolic peak, prolonged acceleration time, more reduced acceleration slope. Further, the systolic TA was reduced from 260mmHg to 130-150mmHg.

We can observe during the repeated Doppler exam of the renal arteries a particular aspect of the flow in the right renal artery. In the proximal segment, the Doppler recording of the sanguine flow has almost a normal aspect (figure no. 5). In these conditions, the established conditions for the echographic definition of the renal artery stenosis are missing, meaning systolic speed > 180cm/s with RAR > 3,5 (proportion between the systolic speeds in the renal artery and the aorta) but the criteria for the appreciation in the hilum of the renal artery stenosis are present: acceleration time > 100msec, acceleration coefficient (dV/dT) < 291cm/s, „tardus et parvus” profile, meaning the absence of the early systolic peak, prolonged acceleration time, more reduced acceleration slope. Further, the systolic TA was reduced from 260mmHg to 130-150mmHg.
following the treatment, fact that led to the diminishing of the systolic gradient at the level of the stenosed segment. Also, the important rise of the diastolic velocity at the level of the closed stenosis arterial segment is met in other vascular territories (internal carotid arteries, aortic coarctation). The velocities at the interlobar and arcuate arteries as well as the cortical velocities were normal at the level of both kidneys. The echographic exploration of the two left renal arteries could not be made accurately.

Figure no. 5. Pulsed Doppler interrogation of the sanguine flow in the proximal segment of the right renal artery

After some months of treatment the patient is hospitalized at the Heart Institute in Cluj Napoca, in order to make the selective angiographic examination of the renal arteries. It was surprising the fact that at the first angiographic examination, there were no stenosed modifications at the level of the kidney vessels. Due to the clinic conditions and to the Doppler echography and the CT-angiography result that were sustaining the renovascular etiology of the hypertension, the angiographic exam was repeated and the result is different: left renal artery branch accumulated stenosis (the other branch was without injuries). The left renal artery angioplasty is performed, balloon expansion, with a good result, residual stenosis below 25%. Again, we can observe stenoses at the level of the right renal artery.

The evolution of the patient is good; the medication is reduced, presently being under treatment with calcium blocker (half of the initial dose) and angiotensin II receptors blocker in combination with thiazide-like diuretic.

CONCLUSIONS

Our patient is young, with very high blood pressure values, discovered by accident, without unusual symptoms. All these make us think of a renovascular etiology of a secondary arterial hypertension. The imagistic investigations made in order to confirm the diagnosis of renal artery stenosis had each its own limits but they were complementary.

The Doppler echography of the renal arteries made it clear the right renal artery stenosis. The CT-angiographic examination confirms the suspicion of right renal artery insufficiency, but without distinguishing clearly the stenosis area; further, on the left side, it is shown a vascular anomaly with two renal arteries. The selective renal arteriography made for diagnosis and therapeutic purposes offered some surprises, at the first examination, the renal arteries being without injuries and at the second one it revealed the closed stenosis of a left renal artery, with no reference to the right renal artery.

The echocardiography revealed: concentric LVH (at a 19 year old patient), efficient left ventricle but with moderate diastolic dysfunction.

The evolution under treatment was favourable and the angioplasty at the level of the left renal artery stenosis led to the diminishing of the medicine doses.

In order to make the diagnosis more precise, the patient could have benefited of renal scintigraphy, RMI-angiography or spiral TC but the renal selective arteriography should be the most valuable diagnostic method with important therapeutic implications.

Further on, the patient needs periodic medical surveillance as the present injuries could progress and the renal artery that was subject to angioplasty presents a stenosis risk, thrombosis or dissection.

The particularities of the case are multiple: very high values of the TA to a 19 year old male patient, almost asymptomatic, the early appearance of hypertensive cardiopathy (concentric left ventricular hypertrophy, moderate diastolic dysfunction of the left ventricle), furthermore the defect of restrictive ventricular septum and the basal IVS aneurysm, the anomaly of renal arteries. Moreover in order to make the diagnosis and to locate the areas of the renal arteries stenosis the three imagistic examinations had each its role, importance and limits but finally being complementary.

REFERENCES