

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

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## 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.

## Cuvinte cheie:

hipertensiune renovasculară, stenoze artere renale, anomalie artere renale, hipertrofie ventriculară stângă, disfuncție diastolică ventriculară stângă

**Rezumat:** Stenozele de artere renale reprezintă cele mai frecvente cauze de hipertensiune arterială secundară. Boala aterosclerotică, afectând în principal treimea proximală a unei artere principale, se întâlnește mai ales la vârstnici. Displazia fibromusculară afectează mai ales cele două treimi distale și ramurile arterelor renale și se întâlnește mai ales la femei tinere. Boala renovasculară este o importantă și adesea nerecunoscută cauză de insuficiență renală, hipertensiune refractară și mortalitate cardiovasculară globală. În măsura în care boala arterială renală severă poate cauza disfuncție renală, identificarea și tratamentul stenozelor semnificative de artere renale poate avea beneficii majore asupra sănătății. Vom prezenta un caz mai interesant ce se încadrează în această patologie întâlnit în practica noastră medicală. Particularitățile cazului sunt multiple: apariția unei hipertensiuni severe (TA sistolică peste 260mmHg, BP diastolică peste 150mmHg) la un pacient de sex masculin în vârstă de 19 ani, absența simptomelor, anomalia de artere renale, concordanțele și discordanțele investigațiilor imagistice, apariția precoce a complicațiilor hipertensiunii arteriale, respectiv a hipertrofiei ventriculare stângi și a disfuncției diastolice a ventriculului stâng, asocierea la cardiopatia hipertensivă a defectului de sept ventricular și a anevrismului de sept interventricular bazal.

## 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.

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## CASE REPORT

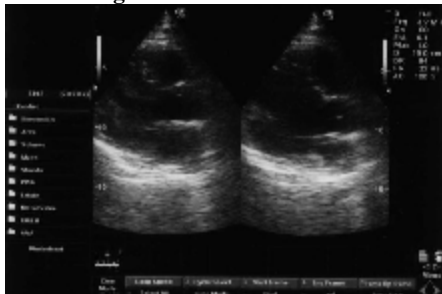
19 year-old patient, P.T., male, from the countryside, at a routine control was diagnosed with very high TA values, 260/155mmHg. The patient presented only a mild asthenia and intolerance at big efforts. He did consider himself hypertensive, he did not follow any treatment, did not have chronic affections 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  $\approx$  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).

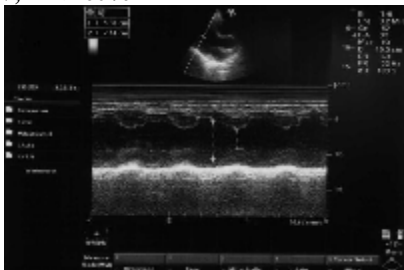
**Figure no. 1. PSLA Section (parasternal long axis): concentric left ventricular hypertrophy**



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



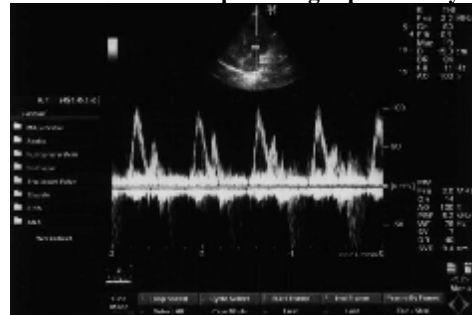
**Figure no. 3. PSLA Section, mode M: concentric LVH, efficient LV, FE > 60%**



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 (IVRT=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

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.

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.

## CONCLUSIONS

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