

Pulmonary Hypertension Associated With Myocardial Amyloid Degeneration: a Case Report

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Abstract

Background: There is very little literature on Pulmonary hypertension associated with myocardial amyloid degeneration. At present, only 10 cases pulmonary hypertension caused by amyloid protein deposits in the pulmonary blood vessels have been reported by Eder et al. We reported a case that the patient was pulmonary artery hypertension combined with myocardial amyloid change. It's aim to claims that pulmonary hypertension is most likely caused by amyloid fibrin deposition in pulmonary blood vessels.

Case presentation: We report a case of a 65-year-old male patient with with AL and ATTR combined type amyloidosis who developed right heart failure because of severe pulmonary hypertension. Pulmonary hypertension due to deposition of amyloid in the pulmonary vasculature is an uncommon finding; however, it should be considered in cases of unexplained pulmonary hypertension in patients with amyloidosis.

Conclusion: we present a men with amyloidosis who developed dyspnea and right heart failure and was diagnosed with pulmonary hypertension, most probably secondary to pulmonary vascular involvement by amyloid fibrils.

Case Presentation

Male, 65 years old. Shortness of breath 4 years after activities, worsened for 3 months. Since 2016 patients began to appear shortness of breath, no other discomfort. Echocardiogram: left atrium (LA) : 36mm, Left ventricular end diastolic dimension (LVEDD) : 46mm, right ventricular (RV) : 38mm, estimated pulmonary artery systolic pressure (sPAP) 132mmHg; pulmonary artery CTA: no section and above embolism; pulmonary ECT: no clear pulmonary embolism lesions image. Right heart catheter examination: right arrhythm average pressure 4mmHg, pulmonary artery pressure 77/26/45mmHg, pulmonary small artery wedge pressure 4mmHg, acute vascular reaction test: negative. Pulmonary angiography : a narrow or closed part of the pulmonary artery is visible. Consider that the patient is chronic thromboembolism pulmonary hypertension (CTEPH), treated with Bosantan, Warfarin and other drugs. The patient feeled that the symptoms are getting worsen 2020, so in hospital again, and treated by balloon pulmonary angioplasty and drugs, the improvement was not obvious. Dec 2020, the patient hospitalized in Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences for further treatment.

The patient smoking for 30 years, had given up 4 years, had no other special medical history and denied high blood pressure or diabetes.

Physical examination: height: 160cm, weight: 59kg, BMI: 23.05kg/m².

The heart rate 64 times / minute, A2<P2, the valve areas are not heard and murmurs, Unheard and heart-pack friction sound, no other exceptions were found.

Auxiliary check:

Blood routine: hemoglobin 120g/L, no other abnormality. Urine routine: submersion blood plus / - protein 1 plus. Bio-chemical examination: high total bilirubin 28.69 μ mol/L, high uric acid 481.21 μ mol/L. High type B sodium urine peptide: 1538pg/mL, high N end brain sodium peptide prebiot: 6112pg/ml. Tumor Markers: high Sugar Antigens 19 – 9:37.3U/ml (0-31.3), high Sugar Antigens 12 – 5: 201.68U/ml (0–35. Hypersensitive tscalin: 0.126 ng/ml (0-0.034). Coagulation function: Coagulation enzyme original time: 16.2S, active partial clotting enzyme time: 42.6S, international standardization rate 1.29, D-Dimer: 0.78 μ g/ml, fibrinogen degradation product 2.5 μ g/ml. Arterial blood gas analysis: pH 7.483, pCO₂ 31.3mmHg, pO₂ 59.5mmHg, SaO₂ 90.3, standard remaining alkali 0.2mmol/L, alfuob-arterial oxygen pressure 110.4mmHg. Iron metabolism, Thyroid function, inflammatory factor spectrum did not see abnormalities; No abnormal activity was found in 16 anti-nuclear antibody spectrum, anti-GBM antibody, anti-phospholipid antibody spectrum, protein C, protein S, anticoagulant enzyme III. Echocardiogram: LA 32mm, LV 37mm, LVEF 55, RV 20mm, TAPSE 12mm, estimation sPAP 68 mmHg, conclusion: moderate pulmonary hypertension, right heart enlargement, right heart function reduces left wall thickening, considering the possibility of hypertrophy cardiomyopathy, left chamber cleature function is reduced. Lung perfusion visible: No clear signs of pulmonary embolism were seen in both lungs. Breathing function: FVC 3.19L, Pred 94%; FEV₁ 1.97L, Pred 78%; FEV₁/FVCPred 87%; DLCO Pred 49%. Mild obstructive breathing dysfunction, dispersion function moderate impairment. Chest X-ray: Double lung texture is generally normal, double pulmonary artery slightly wider, pulmonary artery section full, right room enlargement, heart-to-chest ratio: 0.66. Pulmonary CTA: pulmonary hypertension changes, no signs of embolism in pulmonary arteries above the two-sided section. Heart MR flat sweep: cardiomyopathy, left and right wall thickening and diastic restriction, pulmonary hypertension, the volume of fluid in the heart bag. Heart MR enhancement: Cardiomyopathy, left and right chamber wall thickening and diassis restriction, pulmonary hypertension, left and right chamber wall and wall diffuse delay strengthening, consider the possibility of myocardial amyloid change.

The patient was treated with low-molecular anticoagulant, diuretic, Levosimendan injection strong heart, gastric care, Bosantan targeted drug .

Right heart catheter examination (Table 1): cavity vein oxygen saturation 64.25, right agency oxygen saturation 62.67, right heart chamber oxygen saturation 60.15, pulmonary artery oxygen saturation 59.7, arterial oxygen saturation 59.7; 14mmHg, right culmonary pressure 78/0/11mmHg, pulmonary artery pressure 79/36/50mmHg, pulmonary small artery wedge pressure 12/13/12mmHg; QP/QS 0.87, CI 2.44L/min/m², pulmonary vascular resistance 11.38 Wood. Pulmonary artery atomtomy (Fig. 2): aortic artery widening, left and right pulmonary artery near-end dilation, each segment, sub-section of the pulmonary artery did not see stenosis and filling defects, tube cavity smooth, slow blood flow, far-end perfusion is not uniform, the corresponding venous reflow shallow. Cardiocardial endometrial biopsy: myocardial amyloid degeneration, compound type. Immune histification results: TTR (-), APO A1 (-), APO All (-), APO AIV (-), AA (-), Kappa (-), Lambda (?). Electroscope: a small number of cardiomyocyte collagen fiber dissolved, did not see collagen fiber cross-arrangement. The number of mitochondrials is slightly

larger, mitochondrial swelling and dissolution is rare, there are not many lipid droplets and lipolytin in cells, no glycogen accumulation, no myelin-like structure. The substrate of myocardial cells was clear, no T-tube expansion was seen, and no abnormality was seen in the structure of the leap disk. The intermyocardial mass is found in a large number of branchless fiber structures, which are deposited with amyloid.

Table 1
Right heart catheter examination

Parts	oxygen saturation of blood %	pressure/mmHg	PVR	11.38
Upper and lower cavity veins	64.25		CI	2.8
RA	62.68	15/18/14	Qp/Qs	0.87
RV	60.15	78/0/11		
PA	59.7	79/36/50		
femoral artery	93.9			
PAWP		12/13/12		

In summary, it can be clear that the patient was pulmonary artery hypertension combined with myocardial amyloid change. As our hospital is a specialist hospital for cardiovascular diseases, patients in other hospital taking test of serum free light chain, the results show that: free light chain: 184.3mg/L (References: 5.71–26.3), taking mefalun, dexamison for treatment. The patient feeld symptoms improved significantly after discharge.

Discussion

Amyloidosis is the general term used to refer to the extracellular tissue deposition of fibrils composed of low molecular weight subunits of a variety of proteins, many of which circulate as constituents of plasma. These deposits may result in a wide range of clinical manifestations depending upon their type, location, and the amount of deposition[1]. The clinical manifestations of amyloidosis are diverse, depending on the pattern of organ involvement. The variable clinical phenotype and generally nonspecific clinical features makes diagnosis difficult and contributes to diagnostic delays. Age of onset and disease distribution – The usual age of onset of symptoms and disease distribution varies among the various types of amyloidosis [2]. Pulmonary hypertension (PH) hemodynamically defined as mean pulmonary arterial pressure (mPAP) \geq 25 mmHg by right heart catheterization (RHC) at rest is a progressive and fatal condition which usually culminates in right heart failure and death[3].

At present, only 10 cases pulmonary hypertension cased by amyloid protein deposits in the pulmonary blood vessels have been reported by Eder et al [4]. We describe an exception to the hospital first diagnosis of CTEPH, by targeted drug treatment and balloon pulmonary angioplasty (BPA), the effect is not good.

Although the patient has evidence of heart amyloid protein location, but in previous reports, amyloid tiredness and myocardial muscle often cause myocardial threesopathy function is limited, will not cause serious pulmonary hypertension. The most frequent cardiac presentation is that of a restrictive cardiomyopathy with diastolic dysfunction. Right-sided heart failure secondary to PH from vascular amyloid deposits is rare[5–8].

After perfect examination, we can make it clear that the patient is the first class of pulmonary hypertension, but the patient through targeted drug treatment improvement is not obvious. Combined with evidence of amyloid change, we have more reason to suspect that the patient was caused by amyloid protein deposits in the pulmonary arteries.

The mechanism of myocardial amyloid change and pulmonary hypertension: the deposition of light chains appears to have tissue specificity that may depend on the molecular characteristics of the amyloid protein [9]. It has been reported that amyloid deposition causes endothelial dysfunction and proliferation of vascular smooth muscle cells [10].

In summary, it can be clear that the patient was pulmonary artery hypertension combined with myocardial amyloid change. Pulmonary hypertension is most likely caused by amyloid fibrin deposition in pulmonary blood vessels.

Declarations

Ethics approval and consent to participate:

The study was performed with the approval of Fuwai Hospital Ethics Committee (No.2009215). Written Informed Conferences of all participants were obtained.

Consent for publication:

All authors are approve to publish this manuscript on the journal: European Journal of Medical Research.

Availability of data and materials:

Not applicable

Competing interests:

There is no conflict of interest in this manuscript.

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Authors' contributions:

LY and QXZ designed the overall project, drafted and revised the manuscript, YZ, XL, AQD performed literature search, CMX, ZZZ, QZ critically reviewed and revised the manuscript, ZHL, QL provided professional advice on data interpretation, critically reviewed and revised the manuscript.

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Figures

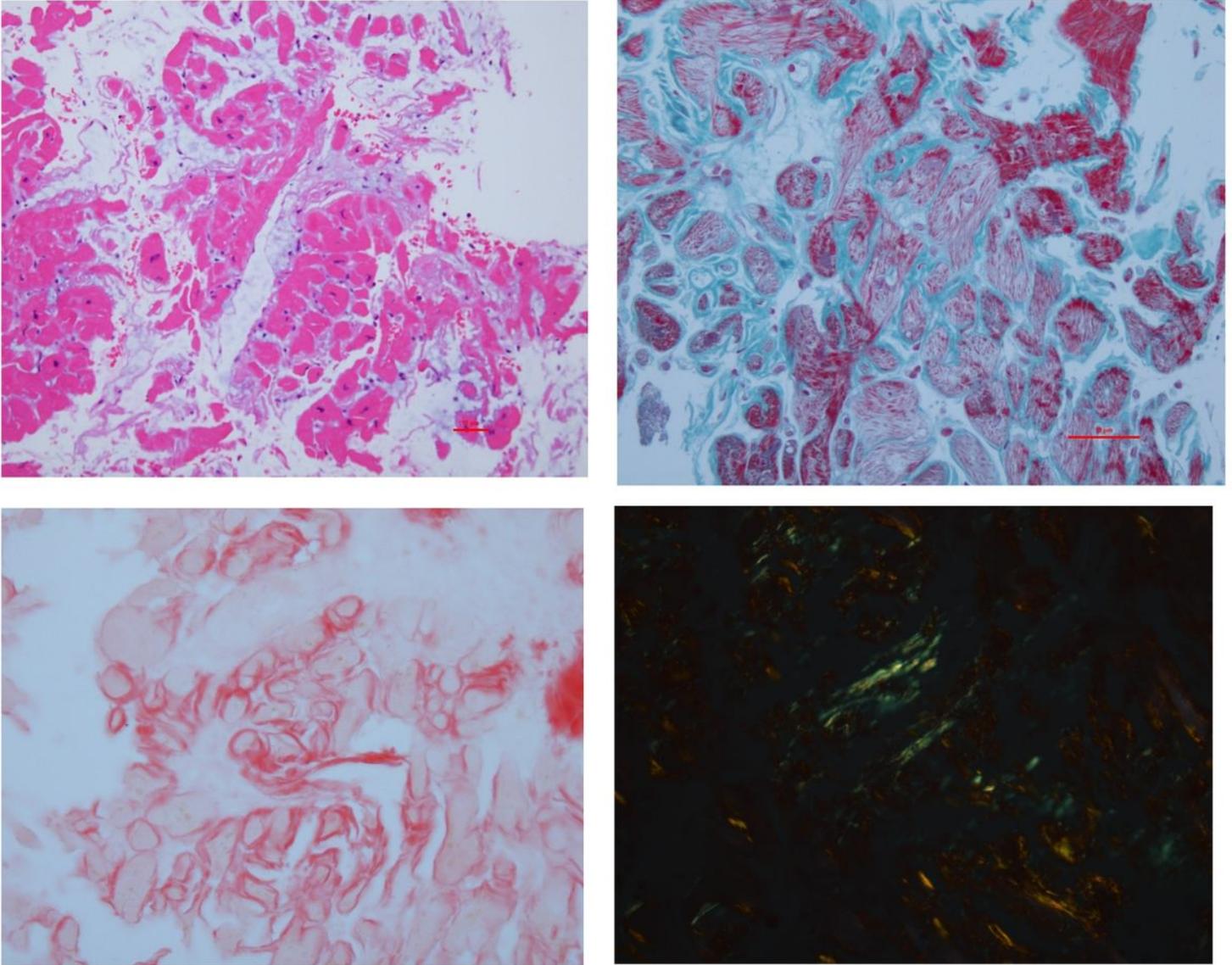


Figure 1

Right chamber interval endocardial cardiomyopathy pathology. Top left: HE Staining; top right: Masson Staining; bottom: Congo red dyeing.

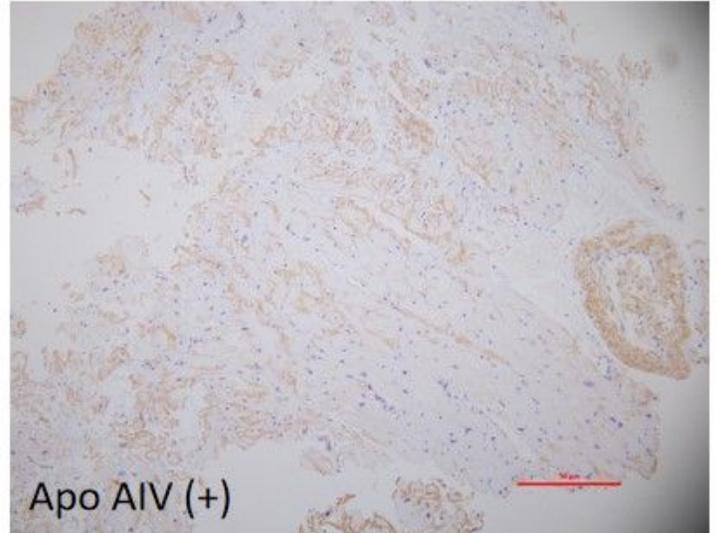
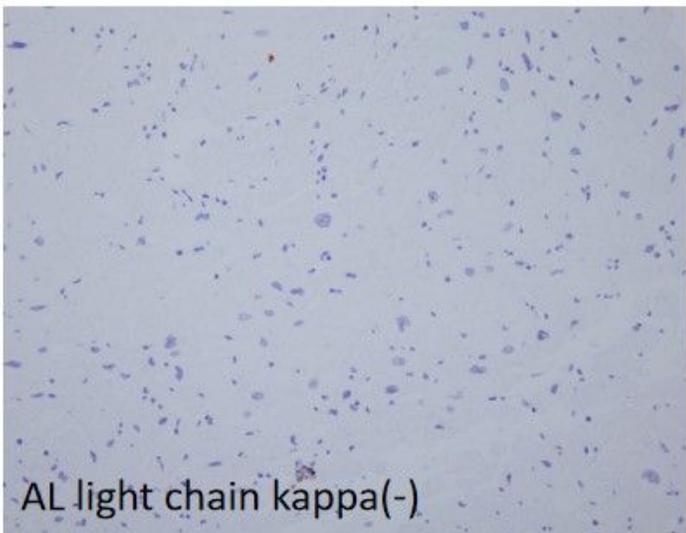
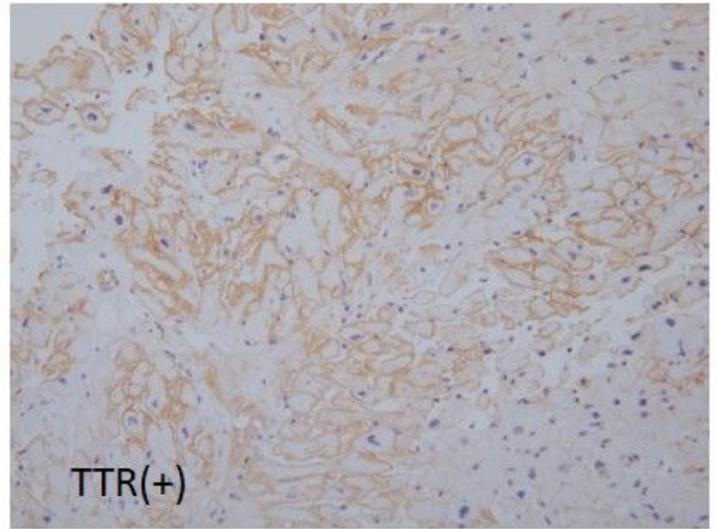
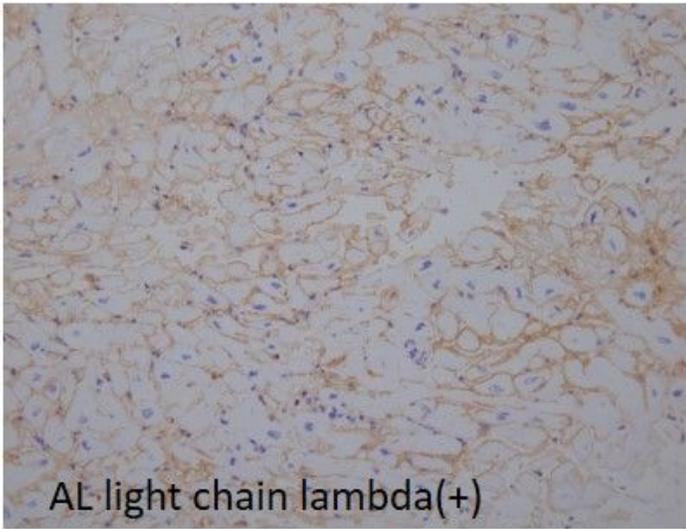


Figure 2

Immune histification results

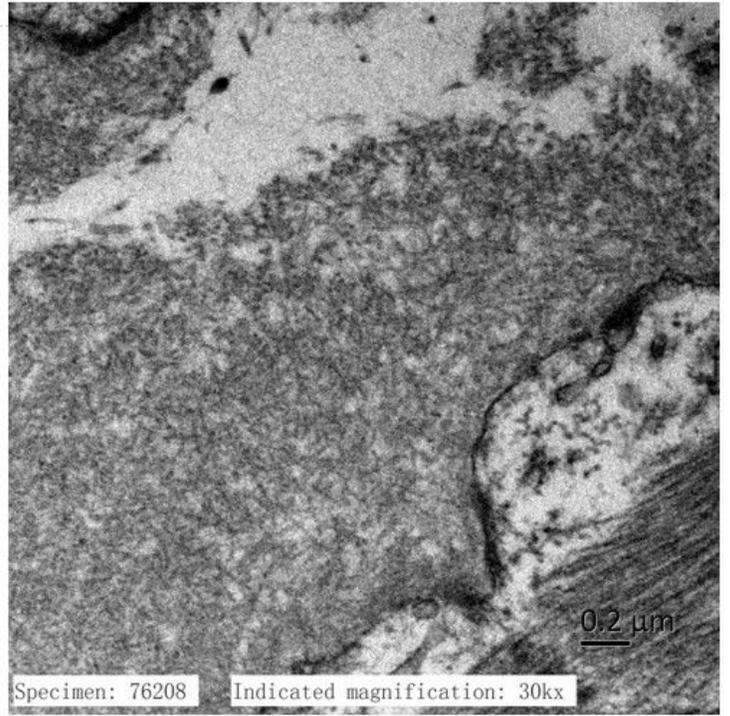
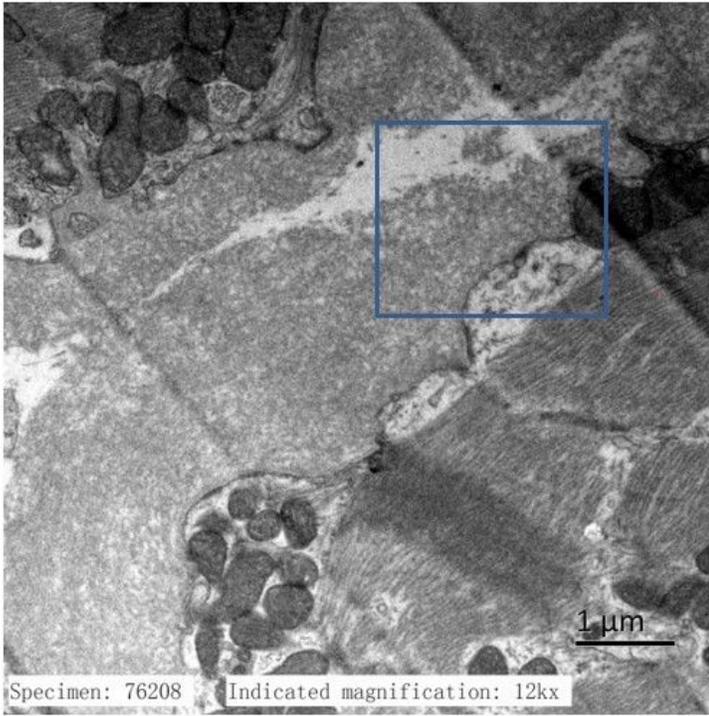


Figure 3

Electroscope