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The patient with severe heart failure secondary to functional mitral regurgitation

Pacjent z ciężką niewydolnością serca wtórną do czynnościowej niedomykalności mitralnej

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Abstract

This case report presents a 59-year-old male with a history of heart failure, ischemic heart disease, hypertension, type 2 diabetes and progressive valvular heart disease in the form of functional mitral regurgitation. Despite the optimal medical therapy, the patient was frequently hospitalized with exacerbations of chronic heart failure over the last 2 years. Management of his condition was complicated by the previously existing concomitant diseases, as well as the development of chronic kidney disease and atrial fibrillation. When the pharmacological treatment was not enough in controlling his condition, invasive treatment of mitral regurgitation was recommended. Finally, for procedural reasons, the patient was disqualified from the transcatheter end-to-end repair, and the decision was made to qualify him for the heart transplantation.

Key words: mitral regurgitation, heart failure, transcatheter end-to-end repair, heart transplant

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Introduction

Mitral regurgitation remains the second-most common valvular heart disease in the European population [1]. Considering the underlying mechanism, it is divided into primary (organic) and secondary mitral regurgitation. Whilst the former is a result of the primary dysfunction of the mitral valve apparatus, most often of the degenerative aetiology; the latter is due to impaired geometry of the left ventricle, most frequently observed in dilated or ischemic cardiomyopathies. In secondary mitral regurgitation, other known as functional regurgitation, the papillary muscles, valve leaflets and chordae are structurally unchanged. The stretching of the mitral annulus disrupts the proper mechanism of the opening and closing of valve leaflets causing the regurgitation wave back to the left atrium. The functional mitral regurgitation (MR) is more prevalent than primary MR and is linked with a worse prognosis [2].

Case report

A 59-year-old male with a history of chronic heart failure, after inferior wall myocardial infarction in 2000 and coronary artery bypass grafting in 2001, with implanted defibrillator

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with cardiac resynchronization therapy (CRT-D), hypertension and type 2 diabetes was admitted to the Department of Cardiology in 2015 for the replacement of the battery of the device. Echo imaging revealed enlargement of the chambers of the heart with a reduced left ventricular ejection fraction (LVEF) of 30% and mild mitral regurgitation.

The patient remained stable up until 2019 when he was hospitalized with symptoms of chronic heart failure exacerbation. The patient complained of resting dyspnoea, decreased effort tolerance, peripheral oedema and persistent, productive coughing. Performed tests revealed increased serum concentration of N-terminal pro-brain natriuretic peptide (NT-proBNP) (> 3800 pg/mL), LVEF of 37% and significant mitral regurgitation. The CRT-D's memory check indicated many atrial fibrillation episodes. The patient was placed in a clinical trial for the treatment of the heart failure (vasopressin vs. placebo), as well as anticoagulation was introduced to his pharmacotherapy (apixaban).

One year later in 2020, the patient was admitted to the hospital with an episode of ventricular tachycardia which was later treated with electric cardioversion. On admission, he presented with irregular heart rate and crepitations at the bottom of the lung fields. Echocardiography (ECHO) revealed an additional tricuspid regurgitation; otherwise, the LVEF and MR remained at a similar level. Lab tests showed increasing dynamics of the cardiac troponins level and high NT-proBNP concentration. Non-ST-segment elevation myocardial infarction was diagnosed. Angiography of coronary arteries and bypassography revealed a functioning arterial bypass to left anterior descending artery and closed venous bypasses. An attempt of percutaneous coronary intervention of AO-OM bypass was unsuccessful, most likely due to chronic total occlusion. Plain Old Balloon Angioplasty was performed. The procedure was complicated by pulmonary oedema. Then the patient was discharged and scheduled for another visit to evaluate the MR and eventual qualification for the transcatheter end-to-end repair (TEER) with the MitraClip system.

In May 2021 patient presented to the hospital with increasing dyspnoea over the last few weeks, orthopnoea and peripheral oedema. His pharmacotherapy was modified by escalating the diuretic treatment, discontinuing angiotensin-converting-enzyme inhibitors and introducing sacubitril/valsartan.

Three months later his condition worsened to the point of multi-organ dysfunction, with NT-proBNP concentration over 12000 pg/mL, elevated troponin, liver and creatinine levels. His main complaint was resting dyspnoea over 3 days and oedema. ECHO showed a reduction of LVEF to 25%. Due to observed hypotension and sacubitril/valsartan and metformin were discontinued, and the dose of apixaban was reduced. Empagliflozin and digoxin were introduced to pharmacotherapy. Given the overall condition, the patient was disqualified by Heart Team from the mitral valve surgery. Finally, for procedural reasons, the patient was also disqualified from TEER.

In October 2021, the patient was admitted for the heart transplant qualification. He remained stable since the last hospitalization, with acceptable effort tolerance, remaining in NYHA II class. ECHO imaging showed no deterioration. Ergospirometry and cardiac catheterization were performed — the patient fulfilled the hemodynamic criteria for cardiac transplant. During the hospitalization, he underwent an episode of syncope. CRT-D's memory revealed non-sustained ventricular tachycardia which transformed into ventricular fibrillation - the patient was successfully defibrillated. Due to chronic kidney disease in stage G4 according to the KDIGO classification, the patient required a nephrology consult, which did not show any urgent indications for the kidney transplant, although further evaluation was advised in the transplant centre for the simultaneous heart and kidney transplant. The abdominal angio-computed tomography revealed a tumorous lesion in the left kidney — suspicion of renal cell carcinoma was raised. In the light of the detection of cancer and concomitant chronic renal failure, the patient was ultimately disqualified from the heart transplant.

Since the last hospitalization, the patient has remained in stable condition, without any exacerbations of his disease. He reports good effort tolerance of 1 km walking distance. Due to COVID-19 related limitations of the planned admissions, the patient has yet to undergo any interventions for the discovered renal tumour.

Conclusions

This case report illustrates the challenges in the approach to the management of the patient with severe secondary mitral regurgitation. Despite the optimal treatment, the patient still experienced frequent exacerbations of heart failure. The presence of chronic kidney disease interfered with the desired pharmacotherapy in the shape of sacubitril/valsartan proposed by the European Society of Cardiology in the 2021 guidelines for the diagnosis and treatment of acute and chronic heart failure. Since the disqualification from invasive methods of therapy, the only option left was to find the right balance in the dosage of drugs, while still taking into consideration the patient's concomitant diseases. The complexity of this case emphasizes the need for an individual approach to the patient's status and the ability to make treatment adjustments based on the current results.

Discussion

The treatment of the secondary mitral valve regurgitation remains in accordance with the general guidelines for the management of heart failure proposed by the European Society of Cardiology. The emphasis is put on replacing

angiotensin-converting-enzyme inhibitors or angiotensin II receptor blockers with sacubitril/valsartan and introducing sodium-glucose co-transporter 2 inhibitors and electrotherapy if indicated [3]. Early assessment of the therapeutic plan should be performed by a multidisciplinary Heart Team. Mitral valve surgery is recommended in cases of severe symptomatic secondary mitral regurgitation despite optimal medical treatment (class I) [4], as well as in patients with indications for coronary artery bypass grafting or other cardiac surgery (class I) [5]. TEER should be considered in symptomatic patients, who despite correct pharmacotherapy, do not qualify for classic surgery and whose condition suggests an optimal response to the treatment (class IIa) [6].

Conflict of interest

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Streszczenie

Opisany przypadek dotyczy 59-letniego mężczyzny z niewydolnością serca, chorobą niedokrwienną serca, nadciśnieniem tętniczym, cukrzycą typu 2 oraz postępującą wadą zastawkową serca pod postacią czynnościowej niedomykalności zastawki mitralnej w wywiadzie. Pomimo stosowania optymalnej farmakoterapii pacjent był wielokrotnie hospitalizowany z powodu zaostrzeń przewlekłej niewydolności serca w ciągu ostatnich dwóch lat. Postępowanie terapeutyczne komplikowały już wcześniej występujące choroby współistniejące, progresja przewlekłej choroby nerek oraz wystąpienie migotania przedsionków. Kiedy leczenie farmakologiczne okazało się niewystarczające w kontrolowaniu objawów choroby, pacjentowi zaproponowano leczenie zabiegowe niedomykalności zastawki mitralnej. Ostatecznie, ze względów proceduralnych, chory został zdyskwalifikowany z przezcewnikowego leczenia metodą brzeg-do-brzegu. Została podjęta decyzja o kwalifikacji pacjenta do transplantacji serca.

Słowa kluczowe: niedomykalność mitralna, niewydolność serca, przezcewnikowa naprawa brzeg do brzegu, transplantacja serca

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