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Challenges of Organ Shortage for Heart Transplant: Surviving Amidst the Chaos of Long Waiting Times

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Heart transplant (HT) remains the gold standard treatment for selected patients with advanced heart failure (HF).[1] However, the increasing number of HT candidates and limited donor supply has led to extended waiting list times.[2] Thus, patients may be at risk of progressive clinical deterioration and delisting due to development of HT contraindication(s).[3]

Left ventricular assist devices (LVADs) improve survival, reduce waiting list mortality, and have significantly changed patient prioritization criteria for HT in several countries.[3-6] Yet, access to LVAD may be restricted in publicly funded healthcare systems.[7] Moreover, patient selection and optimal timing for implantation can be hard to define. Nonetheless, late referral for LVAD may expedite disease progression, often leading to irreversible end-organ dysfunction, limiting the benefits of mechanical circulatory support.

We report a complex and challenging case of rapidly progressing HF in a 38-y-old male, blood type O with a laminopathy-related dilated cardiomyopathy, initially diagnosed at 33 y following cardiac investigation due to an abnormal routine ECG. Although symptoms were initially mild and only reported 3 y later, within 6 mo, he aggravated to New York Heart Association III after an electrical storm event. The patient was subsequently admitted twice for decompensated HF over the next 3 mo and, thereafter, listed for HT. At that time, he was considered unsuitable for long-term LVAD (as a bridge to HT) because of severe right ventricular dysfunction.

After 6 mo, he was readmitted for HF and inotrope-dependency rapidly ensued. Despite escalating doses of intravenous diuretic and adequate mean arterial blood pressure under inotropes, he developed acute on chronic end-stage renal disease with sustained anuria needing continuous hemodiafiltration. Because of irreversible renal failure and given the growing body of evidence suggesting an advantage of combined transplant over isolated HT in patients with end-stage kidney disease on dialysis, the patient was listed for a combined kidney-heart transplant.[8,9] Concomitantly, the patient developed severe amiodarone-induced hyperthyroidism with repeated events of ventricular tachycardia. Thyrotoxicosis required a multimodality approach combining plasmapheresis, glucocorticoids, sodium perchlorate, and propylthiouracil. At last, by month 7 of admission, during nationwide confinement due to COVID-19 pandemic, combined heart-kidney transplantation was successfully performed (Society for Cardiovascular Angiography and Interventions stage C for cardiogenic shock at the time of transplantation). After a long and complex hospitalization, the patient was discharged and referred to cardiac rehabilitation because of severe physical deconditioning. Furthermore, an elective thyroidectomy procedure was scheduled. The patient's course of disease is illustrated in Figure 1.

This case illustrates how advanced HF may rapidly progress. Indeed, our patient hastily transitioned from HF

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S.M. wrote the first draft of this article. B.M.L.R., G.J.L.C., C.B., C.S., and C.A. incorporated feedback in subsequent drafts and revisions. B.M.L.R., G.J.L.C., C.B., C.S., A.T., A.W., J.S.D., C.A., M.M., and J.P.N. contributed to revisions and reviewed the final draft. S.M. composed the figures and submitted the final version of this article on behalf of all the authors.

The patient has verbally consented to the publication of his medical case in a Medical Journal. Members of the Transplant Team (S.M., B.M.L.R., G.J.L.C., C.B., C.S., and C.A.) obtained the informed consent. This investigation was conducted in accordance with the World Medical Association Declaration of Helsinki (seventh revision, Fortaleza, 2013) and the Declaration of Istanbul (2008). Furthermore, the authors declare that the figure within this article (high-risk markers for rapid progression in advanced heart failure patients) does not allow the identification of the patient. Dates were not specified to comply with patient confidentiality.

This case report was exempt from ethics board approval.

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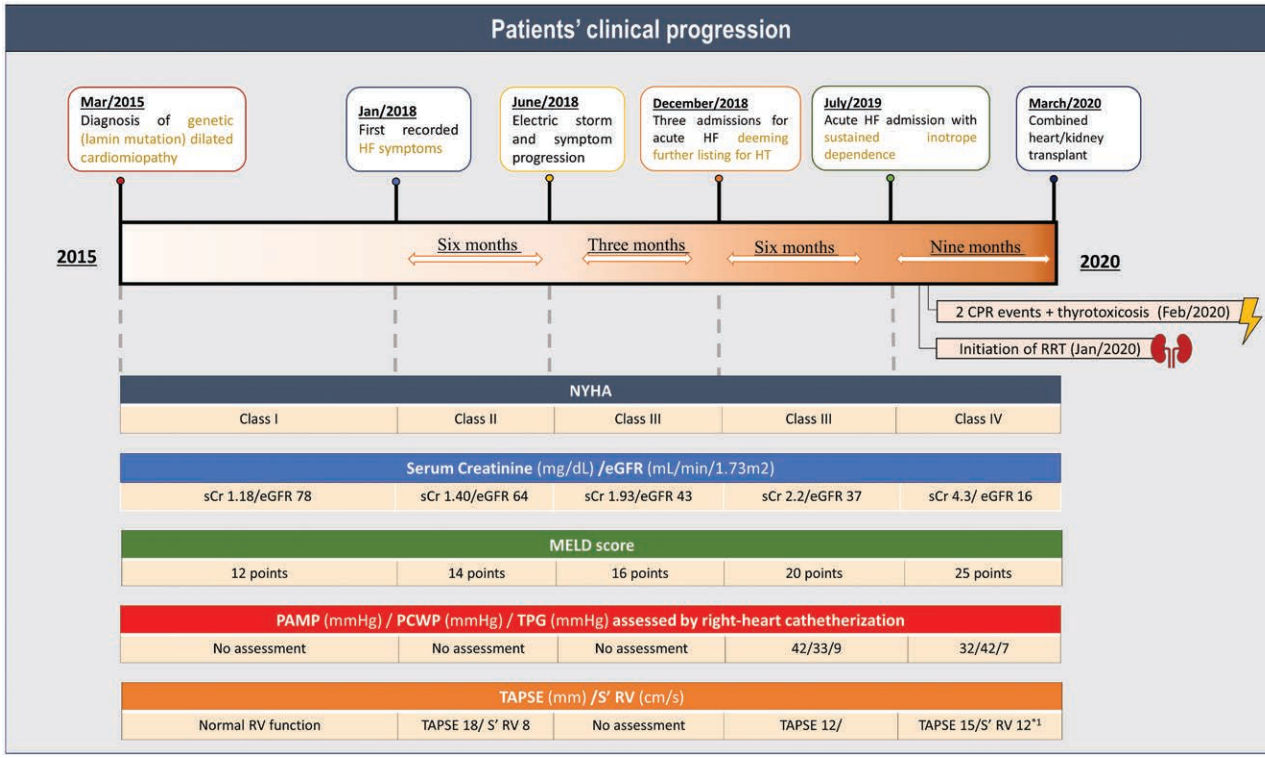

FIGURE 1. Timeline of the patient's HF clinical picture. CPR, cardiopulmonary resuscitation; EF, ejection fraction; eGFR, estimated glomerular filtration rate (by Modification of Diet in Renal Disease equation); HF, heart failure; HT, heart transplant; INTERMACS, Interagency Registry for Mechanically Assisted Circulatory Support; MELD, Model for End-stage Liver Disease; NYHA, New York Heart Association; PAMP, pulmonary artery mean pressure; PAPi, pulmonary artery pulsatility index; PCWP, pulmonary capillary wedge pressure; RAP, right atrial pressure; RRT, renal replacement therapy; RV, right ventricle; sCr, serum creatinine; S'RV, right ventricular systolic excursion velocity; TAPSE, tricuspid annular plane systolic excursion; TPG, transpulmonary gradient.

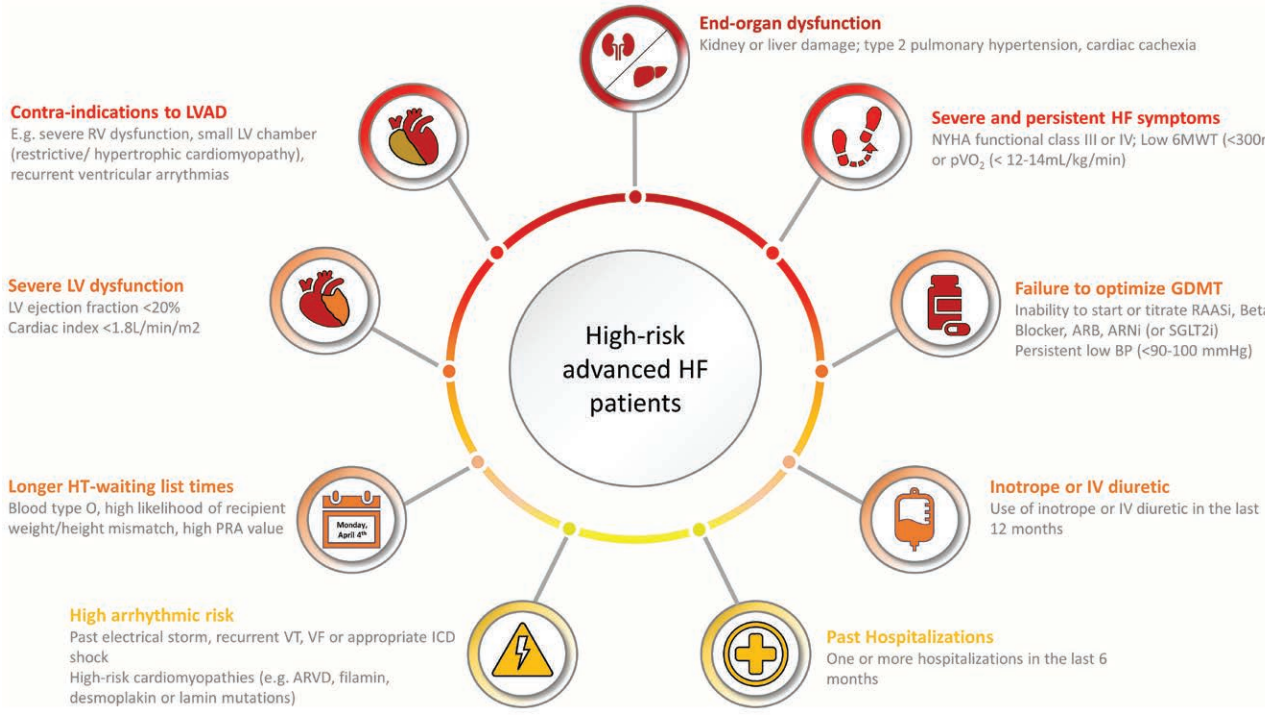

FIGURE 2. High-risk markers for rapid disease progression in advanced heart failure patients. 6MWT, 6-min walking test; ARB, aldosterone receptor blocker; ARNi, angiotensin receptor-neprilysin inhibitor; ARVD, arrhythmogenic right ventricular dysplasia; BP, blood pressure; GDMT, guideline-directed medical therapy; HF, heart failure; HT, heart transplant; ICD, implantable cardioverter-defibrillator; IV, intravenous; LV, left ventricle; LVAD, left ventricular assist device; NYHA, New York Heart Association; PRA, panel-reactive antibody; pVO_2, maximum O_2 consumption; RAASi, renin-angiotensin-aldosterone system inhibitor; RV, right ventricle; SGLT2i, sodium-glucose cotransporter 2 inhibitor; VF, ventricular fibrillation; VT, ventricular tachycardia.

with mild symptoms in an ambulatory setting to being confined to intensive care while sliding on inotropes, need for renal replacement therapy, recurrent ventricular tachycardia, thyrotoxicosis, and cachexia.

Timely referral for advanced HF therapies is paramount, particularly when high-risk features are present (Figure 2), such as those highlighted by the "I Need Help" mnemonic.[10] Deciding the optimal timing for advanced HF therapies can be complex in certain patients (eg, those in whom the clinical course is dominated by malignant arrhythmic events as opposed to progressive pump failure), and we lack tools that accurately predict a quick progression from a misleading stable condition to a critically ill status, as well as the risk of de novo or aggravated comorbidities. Serial evaluations of HF prognosis and end-organ function may be helpful for decisions on timing of referral and prioritization.

Early referral for LVAD as bridge to transplant should be considered in all eligible patients with deteriorating HF and/or those expected to have longer waiting times (eg, blood type O, high panel-reactive antibody value), before severe end-organ or right ventricular dysfunction ensues. For some patients with primary or genetic myocardial diseases, which may eventually lead to biventricular dysfunction, adequate selection criteria for LVAD are yet to be determined. Ventricular arrhythmias are also common life-threatening events in those with advanced HF, and effective and safer antiarrhythmic strategies are urgently needed to improve the chance of surviving while awaiting HT.

Our young patient was able to endure the short-term life-threatening challenges he faced while waiting for a suitable donor; an older, frailer patient might have not. One thing remains clear: many are the challenges faced by those waiting for HT.

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