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Heart failure management – A multidisciplinary approach: Literature review and single center experience

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ABSTRACT

Introduction: Heart failure is a severe chronic disease affecting millions of people worldwide, decreasing their quality of life and having a high burden of mortality. The treatment of the heart failure evolved in a spectacular way in the last years with the development of the new medical therapies, interventions and devices. Unfortunately, outcomes remain poor and need proper implementation of the current knowledge. A multidisciplinary team approach is considered the best way to deliver care for heart failure patients.

Objective: To make a short review of recent data provided by the trials and to describe why the multidisciplinary team approach is necessary during heart failure care. To describe how is the heart failure management performed in our center.

Literature review and our center experience: We analyzed the European Society of Cardiology Guidelines for the diagnosis and treatment of acute and chronic heart failure, made a literature search in Pubmed database and selected the most important articles related to the heart failure management, giving special attention to the evidence provided by the clinical trials.

We describe how we implemented the recommendation and multidisciplinary team approach in Medpark International Hospital, Chisinau, Republic of Moldova.

There are pharmacological management and a non-pharmacological management available. Non-pharmacological management of the heart failure includes cardiac surgery, interventional cardiology, electrophysiology, sleep-disordered breathing treatment, physical therapy, patient education, etc. Many cases of HF patients need a Heart Team approach that includes a cardiac surgeon, an interventional cardiologist, an electrophysiologist and a general cardiologist. We implemented the multidisciplinary approach providing better care for our patients.

Conclusions: The care of heart failure is multidisciplinary and needs some super-specialized team members.

A multidisciplinary team approach is considered the best way to deliver care for HF patients. There are lot of tricky situations when a decision made without the team support could be a wrong decision. To avoid such situations is important to implement the MDT approach and to continually educate the team members, keeping the pace with the HF management updates.

Keywords: Cardiac surgeon, cardiologist, electrophysiologist, interventional cardiologist, heart failure, Heart Team, multidisciplinary team, optimal medical treatment.

Abbreviations

ACEI - angiotensin converting enzyme inhibitors
AF - atrial fibrillation
ARB - angiotensin-receptor blockers
ARNI - angiotensin receptor-neprilysin inhibitor
BB - beta-blocker
CA - catheter ablation
CABG - coronary artery by-pass graft
CIED - cardiac implantable electronic device
CRT - cardiac resynchronization therapy
CRT-D - cardiac resynchronization therapy defibrillator
CRT-P - cardiac resynchronization therapy pacemaker
ESC - European Society of Cardiology
EP - electrophysiologist
HF - heart failure
HfmrEF - heart failure with mildly reduced ejection fraction
HFpEF - heart failure with preserved ejection fraction
HFrEF - heart failure with reduced ejection fraction
ICD - implantable cardioverter-defibrillator
LBBB - left bundle branch block
LBBAP - left bundle branch area pacing
LV - left ventricle
LVAD - left ventricular assist device
LVEF - left ventricular ejection fraction
MDT - multidisciplinary team
MRA - mineralocorticoid receptor antagonists
NICM - non-ischemic cardiomyopathy
PCI - percutaneous coronary interventions
TAVI - transcatheter aortic valve implantation
OHCM - obstructive hypertrophic cardiomyopathy
OMT - optimal medical treatment
SAR - surgical aortic replacement
SGLT2 - sodium-glucose co-transporter 2
SRI - serotonin reuptake inhibitors
QOL - quality of life

1. Introduction

Heart failure (HF) is a severe chronic disease affecting millions of people worldwide, decreasing their quality of life (QOL) and having a high burden of mortality.[1] The incidence and prevalence vary widely between geographic regions. One-year HF mortality has an average of 33% across all adult ages.[2]

Huge efforts are made to develop new strategies in the management of the HF. To exemplify let's think about the last European Society of Cardiology (ESC) guidelines for the diagnosis and treatment of the acute and chronic HF.[3] The guidelines were published in 2021 and in just 2 years, in 2023, a focused update of the guidelines was necessary to be released taking into consideration the new data provided by several trials.[4] Is just an example how quickly is changing the field of the HF management. It evolved in a spectacular way in the last years with the development of the new medical therapies, interventions and devices.

Unfortunately, outcomes remain poor and need proper implementation of the current knowledge. The are many possibilities how we could deal with the challenges in the management of HF patients. A multidisciplinary team (MDT) approach is considered the best way to deliver care for HF patients.

2. Objective

To make a short review of recent data provided by the trials related to the management of the HF and to describe why the MDT approach is necessary.

Another objective of our paper is to describe how is the HF management performed in our center, in Medpark International Hospital, Chisinau, Republic of Moldova.

3. Literature review and our center experience

The main reference papers for our review were 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic HF[3] and 2023 Focused Update of the 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic HF.[4]

We made a literature search in Pubmed database and selected the most important articles related to the HF management, giving special attention to the evidence provided by the clinical trials.

When analyzing the recent evidence about the HF management we describe how we implemented the recommendation in our center, describing the challenges, the obstacles and the solutions. We gave special attention to the description of the MDT approach of our center.

The 2021 ESC guidelines for the diagnosis and treatment of the acute and chronic HF[3] provide information of the full spectrum of the tools available for the management of the HF.

The guidelines make clear distinction of the terminology describing 3 types of HF based of the measurements of the left ventricular ejection fraction (LVEF):

- HF with reduced ejection fraction (HFrEF). The LVEF is ≤ 40%.
- HF with mildly reduced ejection fraction (HFmrEF) have a LVEF between 41% and 49%
- HF with preserved ejection fraction (HFpEF) have LVEF ≥ 50%.

According to the type of the HF the proper management pathway is recommended.
The current ESC guidelines underline the importance of the MDT approach with the next statement: It is recommended that HF patients are enrolled in a multidisciplinary HF management program to reduce the risk of HF hospitalization and mortality.[3]

There are pharmacological management and a non-pharmacological management available. Let's mention all of them to better understand the role of MDT approach.

3.1. PHARMACOLOGICAL MANAGEMENT

A lot of drugs have been developed and currently used in the management of HF. There are angiotensin converting enzyme inhibitors (ACEI), angiotensin-receptor blockers (ARB), an angiotensin receptor-neprilysin inhibitor (ARNI), betablockers (BB), mineralocorticoid receptor antagonists (MRA), loop diuretics, sodium-glucose co-transporter 2 (SGLT2) inhibitors, I_f-channel inhibitor, antiarrhythmic drugs, inotropes, myosin inhibitors, intravenous iron, etc.

The 2021 ESC guidelines for the diagnosis and treatment of the acute and chronic HF were mentioning

the evolution of the treatment of the HF therapy.[3]

The triad of ACEI or ARB, BB and MRA is still recommended as cornerstone therapy in patients with HFrEF taking into consideration the improve in survival, QOL and reduction in the hospitalization, evidence provided by studies as MERIT-HF[5,6], COPERNICUS[7], CIBIS-II[8], SENIORS[9], CONSENSUS[10], SOLVD[11], ATLAS[12], RALES[13], EMPHASIS-HF[14], CHARM-Added[15], CHARM-Alternative[16] and Val-HeFT[17].

Taking into consideration the results of PARADIGM-HF study[18], the 2021 ESC guidelines recommend the use of ARNI as a replacement to ACEI in patients with HFrEF who remain symptomatic on the treatment with ACEI, BB and MRA. In some patients ARNI can be considered as first line drug instead of ACEI.

In 2021, the ESC guidelines recommended to use an SGLT2 inhibitor in all patients with HFrEF, evidence provided by EMPEROR-Reduced[19] and DAPA-HF[20] trials. Later, the information provided by new trials as EMPEROR-Preserved[21] and DELIVER[22] showed clear benefits of the SGLT2 inhibitor use in the treatment of also HFmrEF and HFpEF leading to the focused update of the guidelines in 2023[4]. Some patients may benefit from other drugs as I_f-channel inhibitor ivabradine, data provided by SHIFT trial[23].

The trials PIVOTAL[24] and IRONMAN[25] showed benefits of the intravenous iron therapy in patients with iron deficiency and HFrEF and HFmrEF. Thereby, the intravenous iron supplementation is now recommended to improve symptoms, QOL and reduction of HF hospitalization[4].

Another important area of the pharmacological management is the antiarrhythmic therapy. The BB have a potent antiarrhythmic effect, being Class II antiarrythmic drugs according to Vaughan Williams's classification. Unfortunately, in some patients with HF, the antiarrhythmic effect of the BB is not enough to control the arrhythmia, either supraventricular or ventricular.

Is necessary to know that amiodarone is effective for suppression of supraventricular and ventricular arrhythmias. However, it does not reduce the incidence of sudden cardiac death or overall mortality, as was showed by Bardy et al.[26]. Thereby we need to be precautions when managing patients with HFrEF, taking into consideration the indications for implantable cardioverter-defibrillator (ICD) and for catheter ablation, the topic that will be covered latter in our article.

Some words have to be said about the therapies used for HF patients with specific conditions.

In patients with an obstructive hypertrophic cardiomyopathy (OHCM) the treatment with mavacamten, a miosin inhibitor, showed clear benefits improving symptoms and decreasing the obstruction of the LV as was showed in Explorer-HCM trial[27].

Also, the patients with HF have comorbidities as lung disease, kidney disease, diabetes, neurological disease, depression or cancer. All these topics are very well underlined in the 2021 ESC guidelines for the diagnosis and treatment of the acute and chronic HF[3]. It is another reason why the MDT approach is so important. For example, the current data show that depression affects 20-30% of the patients with HF.[28-30] The preferred pharmacological therapies are serotonin reuptake inhibitors. As was shown by SADHART-CHF and MOOD-HF trials, both sertraline and escitalopram are safe in the treatment of HF patients, but did not provide greater reduction in depression or improved cardiovascular status compared to placebo.[31-32]

When the patient is taking all recommended drugs, we can say is on optimal medical treatment (OMT).

3.2. NON-PHARMACOLOGICAL MANAGEMENT

When we speak about non-pharmacological management of the HF we mean cardiac surgery, interventional cardiology, electrophysiology, sleep-disordered breathing treatment, physical therapy, patient education, etc.

Many cases of HF patients need a Heart Team approach that includes a cardiac surgeon, an interventional cardiologist, an electrophysiologist and a general cardiologist.[33,34] The Heart Team will elaborate the best strategy taking into considerations the risks, benefits and the patient preferences.

3.2.1. Cardiac surgery

What can a cardiac surgeon offer as a member of the Heart Team and MDT?

First of all, many patients with advanced HF patients will need heart transplantation at some moment. It remains the gold standard for refractory HF cases.

As a bridge to heart transplantation some patients will need left ventricular assist device (LVAD) implantation.

Some patients with HF have indications for coronary artery by-pass graft (CABG) surgery, others have indications for valvular surgery, some patients with OHCM need myectomy with mitral valve repair.

The data provided by the recent trials and meta-analysis have refined the guidelines for Heart Team and continue to provide recommendations. For example, as was showed by Wu et al. the surgery to repair mitral valves in patients with severe left ventricular dysfunction do not improve mortality.[35] This is why in secondary (functional) mitral regurgitation the Heart Team will avoid the surgery if possible. The team will verify if the patient with HFrEF is on OMT taking all recommended drugs as ARNI, BB, MRA, SGLT2; will evaluate the coronary arteries, will see if there are indications for cardiac resynchronization therapy (CRT) and will take the best decision. Some patients will need surgical valve repair.

Patients with LV aneurysm refractory to the OMT may need surgical aneurysmectomy performed using Dor or another technique with improve in LV volumes, systolic function leading to symptomatic improvement.[36]

Cardiac surgeons will manage surgically the patients with OHCM. As was mentioned by Maron et al. the

myectomy provides permanent abolition of outflow gradients with reversal of HF and highly favorable long term survival.[37] Unfortunately, as was mentioned by Pellicia et al. not all centers have the necessary experience performing very low number of myectomy procedures.[38]

And last, but not the least, in all the patients with atrial fibrillation (AF), when a cardiac surgery is planned the Heart Team need to discuss the indications for surgical AF ablation. The Maze procedure was refined during last years. In 2004 Levy described the use of Cardioblate (Medtronic) radiofrequency (RF) device to perform surgical ablation of the AF.[39] In the recent review and meta-analysis was shown that surgical AF ablation during cardiac surgery improves freedom from AF.[40] The 2024 ESC Guidelines for the management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery provide clear recommendation to consider surgical AF ablation during mitral valve surgery and in some non-mitral valve surgeries.[41]

3.2.2. Interventional cardiology

As a valuable member of the MDT and Heart Team, the interventional cardiologist will have the opportunity to help the HF with minimally invasive techniques such a percutaneous coronary intervention (PCI), endovascular valvular procedures in selected patients.

Bista et al. have published evidence of no apparent benefit of PCI in severe ischemic cardiomyopathy as compared to OMT, but that CABG improves outcomes in this patient population.[42]

Taking into consideration the gap in evidence, is important to follow the last updates related to the revascularization strategy. For example, Gallinoro et colleagues have found that in patients with HFrEF deferring revascularization of intermediate coronary stenoses based on fractional flow reserve is associated with a lower incidence of death and major adverse cardiovascular and cerebrovascular events at 10 years[43], DeVore at al. published data that in patients with stable coronary artery disease amenable to PCI and moderate or severe LV systolic dysfunction, the addition of PCI to medical therapy did not improve long-term mortality, or the composite of mortality or cardiovascular hospitalization[44].

Transcatheter aortic valve implantation (TAVI) and surgical aortic replacement (SAR) in high risk patients was shown to have similar rates of survival at 1 year, although there were important differences in periprocedural.[45] Later, the PARTNER 3 trial showed evidence that among patients with severe aortic stenosis who were at low surgical risk, the rate of the composite of death, stroke, or rehospitalization at 1 year was significantly lower with TAVI than with SAR.[46]

There are contradictory data about the endovascular mitral valve repair with the use of MitraClip device (Abbott), provided by MITRA-FR and COAPT randomized trials.[47,48] The 2021 ESC guidelines for the diagnosis and treatment of the acute and chronic HF mention that the difference in the results could be explained by differences in trial design and recommends to perform percutaneous edge-to-edge mitral valve repair only in carefully selected patients who remain symptomatic (NYHA class II-IV) despite OMT, with moderate-to-severe or severe secondary mitral regurgitation and, favorable anatomical conditions.[3]

3.2.3. Cardiac electrophisiology

In the last years an important role in the management of HF patients is played by the cardiac electrophysiologists (EP).

What can an EP do for the management of HF? We can divide the task in two fields: cardiac implantable electronic devices (CIED) and catheter ablation (CA).

3.2.3.1. Cardiac implantable electronic devices

Let start with the fact that many patients with HF have an CIED. The interrogation of the device can provide important data about AF burden, thoracic impedance or ventricular arrhythmia. Using that information, we can better understand the efficiency of AF or ventricular arrhythmia treatment. We can use pacing maneuvers to perform conversion to sinus rhythm in patients with atrial flutter.

In some HFrEF patient who developed pacemaker induced cardiomyopathy we will upgrade the device to CRT.

The patients with HFrEF will need an ICD or CRTD for primary prevention of sudden cardiac death and we will consider ICD or CRTD implantation in all patient for secondary prevention. The importance of the ICD vs antiarrhythmic therapy was clearly demonstrated by randomized trials as AVID, CASH, CIDS. There is a 28% reduction in the relative risk of death with the ICD that is due almost entirely to a 50% reduction in arrhythmic death.[49]

In patients with non-ischemic cardiomyopathy (NICM) with HFrEF the DANISH trial did not show a significant benefit from ICD therapy[50], but the 2021 ESC guidelines for the diagnosis and treatment of the acute and chronic HF underlines the importance to understand that NICM is a heterogeneous condition, therefore careful evaluation of the indications should be done.[3]

For more than 20 years the CRT is an important tool in the management of the patients with HFrEF and left bundle branch block (LBBB). The evidence of the benefit of the CRT was shown in several trials as MADIT-CRT[51], CARE-HF[52] and REVERSE[53].

There are many advances in the field of CRT therapy in the last years from the development of the quadripolar LV leads and going to the development of the physiological pacing using His pacing or left bundle branch area pacing (LBBAP).[54]

3.2.3.2. Catheter ablation

A huge area where an EP can provide important support in the management of HF patient is the management of the arrhythmias using CA.

HF and AF are two disorders that frequently coexist and

complicate one another.[55] There is rate control strategy that can be achieved with medication, but also rhythm control strategy that can be achieved either with the use of antiarrhythmic drugs or CA.[3]

The CASTLE-AF trial showed that CA of AF improves the prognosis in patients with HFrEF[56], but the CABANA trial showed the improve in QOL only and not the prognosis in patient with CA vs. medical therapy.[57-59]

Another option in the management of the HF in patients with AF is ablate and pace strategy, when atrioventricular junction ablation is performed together with CRT implantation. The beneficial effect of such a strategy was provided by APAF-CRT trial.[60,61] The trial showed that ablation plus CRT was superior to pharmacological therapy in reducing HF and hospitalization and improving QOL in elderly patients with permanent AF and narrow QRS.

Ventricular arrhythmias need special attention in patients with HF. They can be a complication of the HF and present a significant risk for sudden cardiac death. But there can be also HF as a consequence of a ventricular arrhythmias as frequent premature ventricular contractions, idioventricular rhythm, etc.[62,63] As we early mentioned, Bardy et al.[26] showed that amiodarone is effective for suppression of supraventricular and ventricular arrhythmias, however, it does not reduce the incidence of sudden cardiac death or overall mortality. So, after considering ICD or CRTD implantation, a catheter ablation can be performed to avoid shocks or to avoid the need in amiodarone therapy.

3.3. OUR CENTER APPROACH

Republic of Moldova is a country in eastern Europe with about 3 million inhabitants. Moldova has a range of public and private medical facilities, public agencies, and authorities. The health care institutions could be primary, secondary, or tertiary level.

In order to obtain free access to the specialized care, health care providers must be contracted with the National Health Insurance Company (NHIC).[64] This is true regardless of state or private tertiary center.

Our center provides the full spectrum of services for patients with HF from ambulatory consultations to invasive open-heart surgery and interventional procedures.

As is schematically shown in Figure 1, the MDT that is providing care for HF patients in our center is led by general cardiologist and includes cardiac surgeons, interventional cardiologists, EP, endocrinologists/ nutritionist, internal disease physicians, neurologist, psychologist, kinesiotherapist and nurses. Every member of the team has its specific role in HF care.

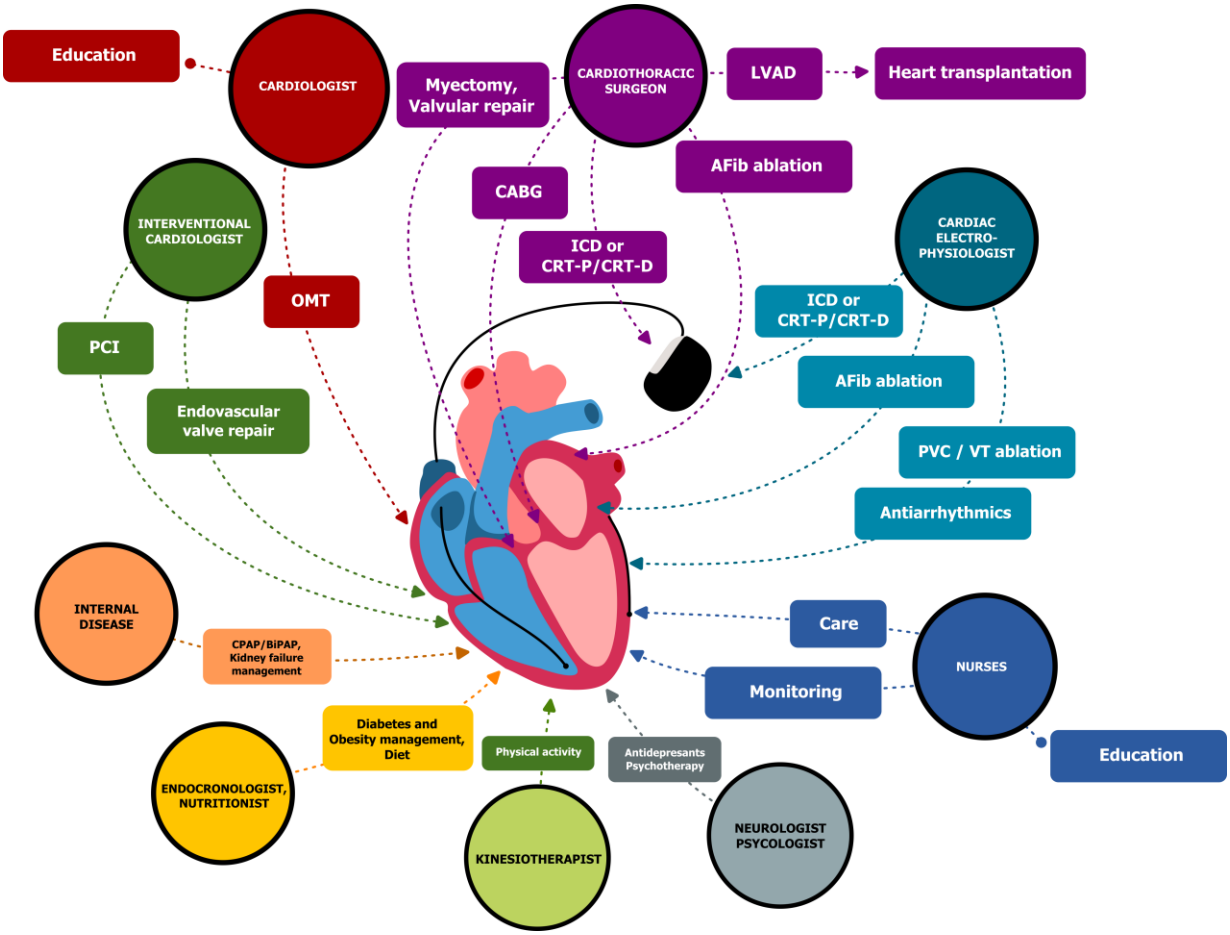

Figure 1. Multidisciplinary team

The chart schematically represents the roles in the multidisciplinary team in the management of heart failure patients. Afib – atrial fibrillation, BiPAP - Bilevel positive airway pressure, CABG - coronary artery by-pass graft, CPAP - continuous positive airway pressure, CRT-D – cardiac resynchronization therapy defibrillator, CRT-P – cardiac resynchronization therapy pacemaker, ICD – implantable cardioverter-defibrillator, OMT – optimal medical treatment, LVAD – left ventricular assist device, PCI – percutaneous coronary intervention, PVC – premature ventricular contractions, VT – ventricular tachycardia.

The leading role in the patient education have general cardiologists and nurses.

Some more specific decisions about the interventional management are made by Heart Team, that includes a cardiac surgeon, an interventional cardiologist, an electrophysiologist and a general cardiologist.

Our cardiac surgery team is one of the most experienced teams in the region. The cardiac surgeons of our center perform open heart procedures via classical sternotomy and via minimally invasive techniques in valvular pathologies, perform on-pump and off-pump CABG surgeries using both arterial and venous grafts, perform complex surgical interventions for the treatment of OHCM, LV aneurysms. We early mentioned the article of Pelliccia et al. about the importance of high number of myectomy procedures to provide good quality of care for patients with OHCM.[38] We want to mention that our surgical team performs about 10-17 surgeries per year using transmitral myectomy approach with complex mitral valve repair.

In 2013 our cardiac surgeons implemented the use of RF ablation of AF during heart surgery. We are using Cardioblate (Medtronic) device and perform RF ablation especially in cases of mitral valve surgery. More that 100 procedures were performed from 2013. Additional retrospective study is necessary to provide information about the freedom from recurrence.

Unfortunately, at the moment there is no legal base in our country to perform heart transplantation. Neither LVAD are implanted in our center.

The interventional cardiologists perform the full amount of PCI procedures, including complex cases, but unfortunately not the full amount of endovascular valve procedures. For example, procedures as endovascular mitral valve repair or TAVI are not performed in our hospital taking into consideration the lack of NHIC financial support at the moment.

Our EP team also had a lot of challenges in the treatment of the HF patients. As we published earlier, we started to perform CRT implantations in 2016, but was only 2019 when we obtained NHIC financial support and could increase the number of the cases.[65] In the last years we implant more then 15 CRTD and more then 10 ICD per year. From 2021 we use only quadripolar LV leads for primary implants. Even there is current evidence of no clinical benefits of the use of quadripolar vs bipolar LV leads,[66,67] we prefer quadripolar leads taking into consideration less issues with phrenic nerve capture, more possibilities to choose lower threshold and to increase battery longevity.[68]

We use the LBBAP in patients with HFrEF or HFmrEF and need for pacing, or in patients with indications for biventricular CRT but without suitable anatomy.

Our EP team makes special efforts to properly manage the patients with CRT. The team is trained to perform the optimization of the CRT using the right ventricle – LV delay adjustment with the echocardiographic guidance.[69] Also, in order to obtain good response to CRT in patient with AF we evaluate the percentage of the biventricular pacing and, if necessary, adjust the dosage of BB or digoxin to decrease the basal heart rate.

In 2015 we started to perform RF catheter ablations for the first time in our country. We started with conventional procedures as atrial flutter, premature ventricular contractions or ventricular tachycardia ablations in patients with HF.[63] In 2018 we starter to perform pulmonary vein isolation using 28 mm Arctic Front Advance cryoballoon (Medtronic) and in 2024 we started to perform RF ablation with Columbus Black Suit 4.2 3D mapping system (Everpace) using FireMagic TrueForce SuperCool (Everpace) catheter for ablation. The preliminary results we obtained after cryoballoon ablation show 70% freedom from AF recurrence,[70] that is comparable to the results from other centers.[71,72] In the next years we will provide information about our results of AF management with the use of RF ablation.

In our center, some of the internal disease physicians, neurologist and pulmonologist are specialized in the management of the sleep-disordered breathing as central sleep apnoea and obstructive sleep apnoea.

As is mentioned in the 2021 ESC guidelines for the diagnosis and treatment of the acute and chronic HF, sleep-disordered breathing is present in more than one third of patients with HF. The patients with HFrEF and HFmrEF being considered for a sleep-disordered breathing treatment with positive pressure airway mask must undergo formal sleep study taking into consideration the fact that if sleep-disordered breathing is caused by central sleep apnoea, positive pressure airway masks are contraindicated in HFrEF patients.[3]

Another task of the MDT includes the screening for depression. If the diagnosis of depression is established, we can either decide to use SRI as we mentioned earlier, or to use psychotherapy.[73]

Edward Everett Hale said: "Together — one of the most inspiring words in the English language. Coming together is a beginning; keeping together is progress; working together is success." This is true also related to HF management.

The care of HF is multidisciplinary and needs some super-specialized team members. Without some of them or with improper collaboration between the members there will be poor outcome for some patients. Crucial decisions about the time for CIED implantation or indications for CA need special attention. Some patients have a chance to avoid unnecessary ICD or CRTD implantation when the full potential of the OMT is used. This is where working together is success. The large real-world registry data demonstrated that the pharmacological therapy is frequently not enough optimized prior to primary prevention ICD placement.[34]

Another aspect we want to recognize is that we frequently do not have enough time for proper patient educations. A lot of improvements could be done related to communication between MDT and the HF patient. Relatives are another important player in this

scenario. This is why is important to implement proper strategies to achieve the established targets.

Finally, an important role in the in MDT is the education of the team members. Is important to keep the pace with the HF management updates provided by the guidelines and scientifical papers. With this approach we can do the care of HF patients the most suitable for the patient needs.

4. Conclusions

The care of HF is multidisciplinary and needs some super-specialized team members. An MDT approach is considered the best way to deliver care for HF patients. The MDT has an important role in using the current knowledge and resources to provide the best possible care for the patient with HF.

There are lot of tricky situations when a decision made without the team support could be a wrong decision. To avoid such situations is important to implement the MDT approach and to continually educate the team members, keeping the pace with the HF management updates.

Edward Everett Hale said: "Together — one of the most inspiring words in the English language. Coming together is a beginning; keeping together is progress; working together is success." This is true also related to HF management. With MDT approach we can do the care of HF patients as much as possible suitable for the patient needs.

Conflicts of interests:

None

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