

Patient with valvular disease: evolving care patterns

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COVID-19 has put each and every one at test. Cardiological clinics are facing constrained resources, limiting timely treatment of patients as usual. Patients with valvular heart disease are one of the most time sensitive patient populations, with delayed therapy possible leading to increased morbidity and mortality. Identifying and allocating the available resources to the most vulnerable patients is crucial in providing optimal patient care with prioritization of essential surgical or percutaneous procedures for valvular heart disease. Implementing telemedicine approaches might help to minimize non-essential physician-to-patient contact to ensure safety, for both patients and lastly but not least the treating physicians.

Introduction

Coronavirus disease 2019 (COVID-19) is a newly emerging human infectious disease that has reached a pandemic level worldwide. Bergamo has been the first Western town (first documented case 23 February 2020) affected by COVID-19 epidemic and throughout Italy, is the town with more cases, ascertained deaths, and it holds the sad record of the city with the highest COVID-19 casualties in the world.

The consequences of the COVID-19 emergency for the entire 'Papa Giovanni XXIII' Hospital of Bergamo and in particular for the Cardiology Division have been significant. Cardiology has been organized in a COVID-19 free area, COVID-19 area and grey area, aimed at hosting those suspect patients for COVID-19, but with first negative swab (given the high incidence of false negatives to the nasopharyngeal swabs). We have structured a fast track for patients arriving in emergency from outside, avoiding the Emergency ward, reducing the infection risk. In the acute phase, a significant reduction in acute coronary syndromes and hospitalization for heart failure have been observed.¹

Facing these new challenges, we hereby summarize the first learnings throughout Europe and the rest of the world regarding the specific treatment of valvular heart disease and try to give an outlook on possible future challenges and directions during this time of toilsomeness and hardship.

Specific needs of patients with valvular heart disease

In a pandemic situation such as COVID-19, considerations about diagnostics, monitoring, follow-up and treatment of patients with valvular heart disease centre around the need for balancing limited resources while providing the best potential care.

The population to treat despite COVID-19 pandemic has to be defined according to (i) the risk of delaying the procedure, (ii) the risk of COVID-19 exposure during in-hospital diagnostics and therapies, and (iii) the local geographic and time variation of the pandemic. The target population will depend on the culprit valve and its type of dysfunction; regurgitation, stenosis, or both. Despite some rare expectations, timely check-up or treatment is predominately required in patients with severe valve lesions and will therefore present the focus in the following. For aortic stenosis, asymptomatic, stable patients are likely to be safely

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Table 1 Simple proposed criteria for guidance and clinical decision-making on when to intervene valvular heart disease in the COVID-19 era**Urgent intervention**

- Severe or unstable symptoms or surrogates of progressive heart failure
- Severe heart failure signs or symptoms (NYHA class \geq III) mainly attributable to the valvular heart disease
- Hospitalization for acute heart failure within last 6 months
- Unstable angina
- Syncope (aortic stenosis)
- Reduction in left ventricular ejection fraction or progressive right ventricular dilatation and dysfunction
- Medical therapy refractory symptoms
- Massive stenosis or torrential regurgitation as assessed by an experienced cardiologist and cardiac surgeon

Elective intervention according to local resources**Stable symptoms**

- Moderate heart failure signs or symptoms (NYHA class II, allowing daily routine activities) mainly attributable to the valvular heart disease
- Chronic angina
- Reduced left ventricular ejection fraction and stable right ventricular dilatation and dysfunction
- Increase of diuretics in order to avoid cardiac decompensation
- Raising levels of natriuretic peptides mainly attributable to valvular heart disease

Consider postponing

- Symptoms not attributable to valvular heart disease
- Long-term stable state of valvular heart disease

managed in outpatient care only, with the possibly to postpone follow-up if required. In contrast, in newly symptomatic patients experiencing angina, syncope or signs of heart failure, healthcare contacts are required and need to be adjusted to the circumstances of the pandemic.

In patients with (rheumatic) mitral stenosis, deterioration can occur suddenly and resources for inpatient treatment including facilities to perform mitral valve valvuloplasty might be required. Especially in pregnancy, maternal mortality of untreated mitral stenosis can reach 6.8% particularly during labour and delivery.² In this situation, treatment must be initiated without delay even in case of COVID-19 pandemic. In patients with mitral regurgitation (MR) the need for treatment depends on aetiology and degree of underlying heart failure. Optimal management of underlying heart failure is pivotal, and requires close management and follow-up of patients. Apart from patient-centred surveillance like regularly taking weight, new approaches like telemedicine might open new pathways to improve patients follow-up and direct guideline directed medical therapy. However, if heart failure symptoms become intractable, further in hospital diagnostics and therapy might be necessary to improve symptoms or to allow for improved medical heart failure therapy.

In patients with primary MR, in the absence of left ventricular dilatation³ follow-up might be postponed, as long as patients remain asymptomatic. Primary MR presenting with chordal rupture (acute MR) will almost always lead to detrimental symptoms and diminishing haemodynamics and need surgical or interventional repair as soon as possible irrespective of the COVID state.

Interventional treatment of tricuspid regurgitation, which has seen a steady rise in the last years, has seen its

first devices approved in Europe⁴ but is not performed routinely and is still performed on a case-by-case decision-making which has to incorporate changes in local resources and the risk of infections during the COVID epidemic.

For other rarer procedures such as percutaneous pulmonary valve dilatation or replacement, even if there is usually no emergency to take in charge, timing should be defined according to patient symptoms and haemodynamic tolerance.⁵

Risk stratification

COVID-19 has forced an unprecedented stress on the healthcare system with vast limitation in available hospital resources. This led to the necessity to prioritize interventions and possibly delay some of them for not just weeks but possible months. As even small delays in the treatment of valvular heart disease might have a devastating outcome (e.g. aortic stenosis patients at high risk might have a 20% mortality within 3 months of waiting) providing guidance on which intervention to delay and which to prioritize is desired.⁶ Due to scarcity of data on how to objectively assess the overall risk of patients with severe valvular heart and postponing of interventions, physicians are left to assess patients risk while waiting for treatment, based on subjective experience and opinions.⁷ We here propose these simple criteria based on patients symptoms and general markers of progressive heart failure as presented in *Table 1* in order to guide and ease clinical decision-making.

Treatment

In the times of COVID-19, consideration about treatment also involve patients individual risk, length of hospital stay,

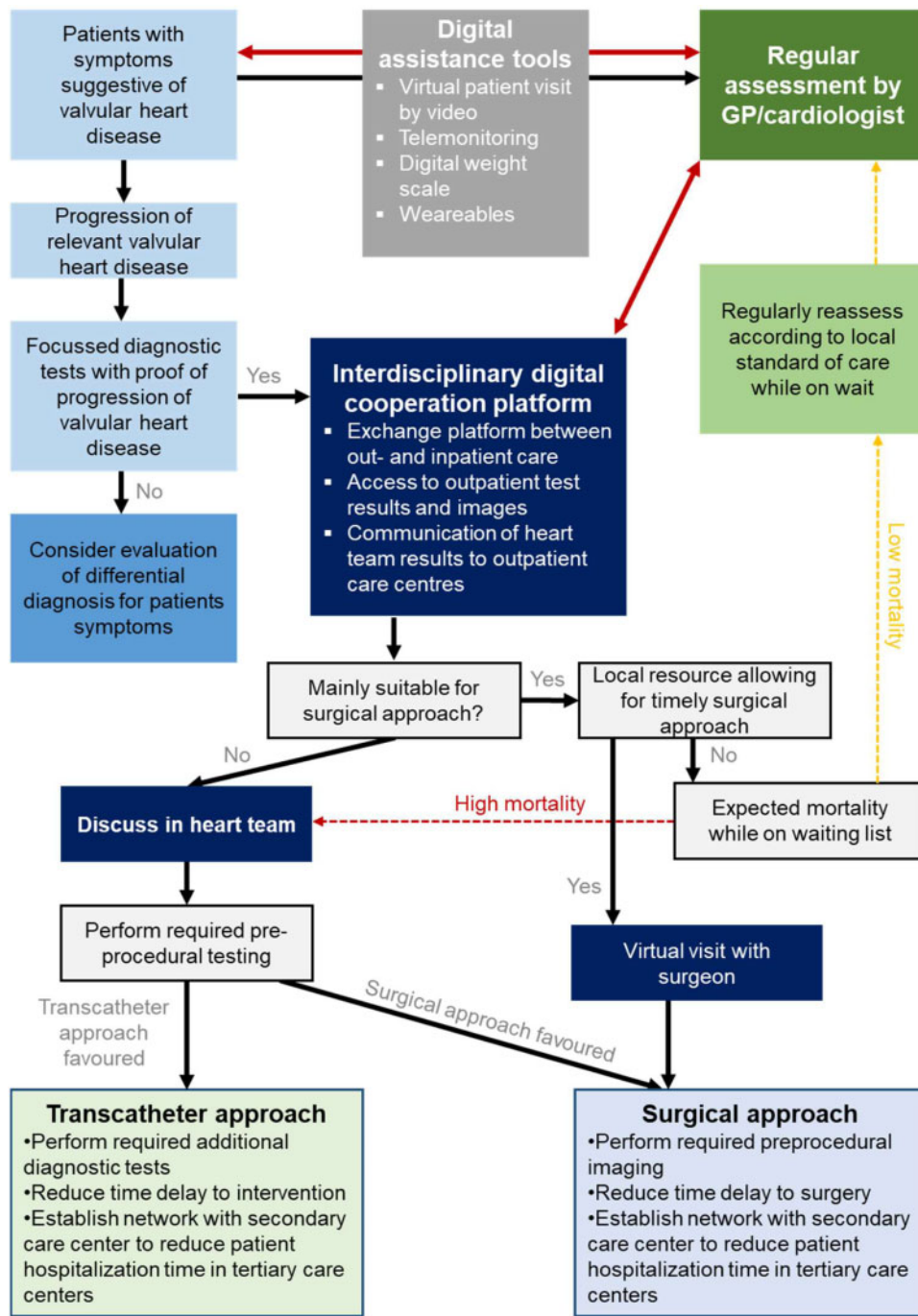


Figure 1 Proposed work flow for the management of patients with valvular heart disease during the COVID-19 pandemic.

and required resources While in younger, healthier patients with severe valvular heart disease, a surgical approach should still be favoured, transcatheter treatment of valvular heart disease has massive advantages as it requires a shorter in-hospital stay and is less resource consuming. Among patients with low perioperative risk and severe aortic stenosis, transcatheter aortic valve replacement (TAVR) has been shown to be superior to sAVR and might even be performed in the cardiac catheterization lab, using conscious sedation, eliminating the need for operating theatre

resources and reducing the time on post anaesthesia care unit.⁸ Establishing a network with local secondary care centres where postoperative patients might be transferred to, might free capacities on the intensive care unit and allow for more patients to receive surgical or interventional treatment of severe valvular heart disease. TAVR might be preferred in patients planned for biological surgical aortic valve replacement (sAVR) in the absence of local resources to perform a surgical approach. However, the role of transcatheter treatment of the mitral- and tricuspid valve in

low risk and younger patients is yet to be determined and data are limited to anecdotal reports, therefore, no evidence-based recommendation can be given for these patients and each case has to be discussed individually.

As local resources and conditions are vastly different among and even within countries, an all-encompassing recommendation cannot be made, and the crucial role of the interdisciplinary heart team further elevates in the COVID-19 era. A surgical approach should still be favoured in patients that are young and have no or only a few comorbidities (Figure 1). However, if local resources prohibit a timely surgical treatment, each patient should be discussed on a case-by-case basis in the interdisciplinary heart team. Weighting the pros and cons the heart team might decide to refer patients to a transcatheter approach when the risk of mortality while on wait for surgical treatment exceeds the potential negative effect of a potentially less effective or suboptimal therapy. Changes in the availability of resources might be a dynamic process and the establishment of an interactive network of in- and outpatient care should improve the possibility to quickly react to these changes and streamline patients in need for intervention. Ideally, a digital platform might be established which exchanges heart-team decisions and clinical patient data acquired by outpatient care. If patients are referred to the waiting list, a close monitoring of the patients clinical condition is urgently required and an integrative approach including out- and inpatient care as well as the heart team is necessary.

It is likely that COVID-19 will also affect patients with untreated severe valvular heart disease and the focus in these patients should primarily be the management of COVID-19. However, in some cases, cardiac decompensation and progressive deterioration of haemodynamics might be induced by severe valvular heart disease. However, in these patients, surgical treatment of severe valvular heart disease should still be avoided as mechanical ventilation and cardiopulmonary bypass might further enhance the inflammatory response syndrome and pulmonary dysfunction, observed in COVID-19.⁹ Again, transcatheter approaches using conscious sedation are preferred. In the absence of severe symptoms or signs of heart failure, patients with confirmed or suspected COVID-19 diagnosis might be managed conservatively until a negative COVID-19 status is confirmed.

Patient follow-up

For the follow-up of patients with valvular heart disease that underwent surgical or percutaneous procedures, telemedicine, using novel and existing virtual healthcare technologies, might be considered. It allows continuation of patient care while limiting the spread of COVID-19 minimizing contact both with and between patients, and enforcing strict hygiene measures. This protects not only patients but also healthcare providers.¹⁰

This tool can provide information on the possible progression of the symptoms and signs of the disease thus helping identify those patients in need of on-person visit. It might especially be beneficial for patients with known risk

factors for COVID-19, such as pulmonary disease, diabetes, immunocompromise, cancer, and those over the age of 65.¹¹

Telemedicine requires good patient collaboration and compliance, through a patient-directed assessment, such as self-assessment of temperature, blood pressure and pulse rate, and even auscultation of a heart murmur through an electronic stethoscope is possible. With these information, recommendations can be made for changes in medication, lifestyle, as well as the time point of the next check-up. However, the majority of diagnostic tests (i.e. radiographic imaging, electrocardiogram, echocardiography) require the physical presence of the patient at a diagnostic centre.

Cardiologists were often asked to utilize telehealth tools to communicate with patients with confirmed or suspected COVID-19 and to provide counselling and/or proctoring to colleagues at other institutions. However, no evidence data exist on the effectiveness of such follow-up assessments in patients with valvular heart disease that underwent surgical or percutaneous interventions. Telemedicine needs to be used with caution and on an individualized basis, weighing the potential risks and benefits.¹² Another crucial factor that does need to be guaranteed with the use of telemedicine is the security of healthcare data, which is a fairly unexplored area in the use of such open networks.

Conclusion

Highlights for the future

In situations in which healthcare systems are at risk of being overwhelmed by a surge in patients, as in the COVID-19 pandemic, healthcare systems around the world have to undertake extensive measures to reallocate and reorganize the available resources. Prioritization of essential surgical or percutaneous procedures for valvular diseases seems to be one of the first approach with the uncertainty of length of the deferment period and the anxiety and of stress inflicted on the patients and their families due to delaying. Implement the use of telemedicine to minimize non-essential physician-to-patient contact is crucial to ensure safety, for both patients and lastly but not least the treating physicians.

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