

5. HEART TEAM – RESULTS OF QUALIFICATIONS IN TERTIARY CARDIOVASCULAR CARE CENTER [SUMMARY]

The idea of Heart Team (HT) as a cooperation of experienced specialists making optimal therapeutic decisions for patients with multivessel coronary artery disease or valvular heart disease has an established position both in the European and American guidelines. A multidisciplinary approach, assessing clinical, angiographic and echocardiographic data, the risk of periprocedural complications, short- and long-term outcomes and patient preferences, seems to be the most rational tool deciding on the optimal management strategy for these "difficult" individuals, burdened with many comorbidities, often elderly, with cancer or frailty syndrome. At the 1st Department and Clinic of Cardiology of the Medical University of Warsaw, the tertiary cardiovascular care center, since 2016, meetings of cardiologists, cardiac surgeons, echocardiographers and specialists in many other fields of medicine are weekly held, aimed at presenting patients, communal discussion and selection of the optimal therapeutic method for further treatment. From 2016 to 2019, 176 HT meetings were held and a total number of 1,925 patients with multivessel coronary artery disease (MVD), aortic stenosis (AS) or mitral regurgitation (MR) were presented and then one of main three strategies: surgical, percutaneous or conservative was selected and implemented for each of them. Clinical, echocardiographic and angiographic data as well as the results of qualifications were collected retrospectively, and then patients were further follow-up to assess periprocedural complications, short- and long-term outcomes, as well as the quality of life depending on the implemented approach. Then, by plotting Kaplan-Meier curves for mortality and cardiovascular (CV) events in long-term follow-up for all main methods of treatment, statistical analysis was performed and the applied strategies were compared with each other.

In the first paper regarding the cooperation of HT at the 1st Department and Clinic of Cardiology, the clinical and echocardiographic characteristics, as well as the incidence of CV events and the quality of life of patients with severe symptomatic aortic stenosis (AS), qualified by HT specialists for one of the three main strategies: surgical aortic valve replacement (SAVR) with optimal medical therapy (OMT) – SAVR+OMT, transcatheter aortic valve replacement (TAVR) with optimal medical therapy – TAVR+OMT or only optimal medical therapy – OMT were evaluated.

From 2016 to 2019, during 176 HT meetings, 656 patients with AS were presented, and finally (after excluding individuals who did not meet the criteria of the study) 482 of them with severe symptomatic AS were included into final analysis. The patients were qualified and then treated according to HT decisions as follows: SAVR+OMT – 85 patients, TAVR+OMT – 318 patients and OMT alone – 79 patients. The median follow-up was 866 days.

The patients qualified for the OMT strategy were the oldest (81.7 ± 8.0 years) and presented with the most severe symptoms of HF (heart failure) [assessed using the NYHA (New York Heart Association) scale], $p < 0.01$; nearly 75% of them were frailty, they were generally most burdened with comorbidities and with the highest risk of intervention, assessed both by the EuroSCORE II (European System for Cardiac Operative Risk Evaluation II) and STS (Society of Thoracic Surgeons) scales, $p < 0.01$.

All patients were assessed by echocardiography – from the OMT–group at the time of HT discussion and from the SAVR– and TAVR–groups – before and after intervention (at the time of discharge from the hospital). Echocardiographic evaluation prior to the HT consultation showed statistically significant differences in the following parameters: LVEF (left ventricular ejection fraction) and the incidence of aortic bicuspid valve, which were the highest in the surgically-treated cohort ($56.5 \pm 12.1\%$ and 13 (15.3%), respectively, $p < 0.05$) and the severity of AS assessed as aortic valve area indexed per square meter (m^2) of body surface area – AVAi (indexed aortic valve area), which was the lowest in the TAVR–group ($0.45 \pm 0.16 \text{ cm}^2/m^2$, $p < 0.01$). Postoperative evaluation showed a statistically significant improvement in echocardiographic parameters: LVEDD (left ventricular end-diastolic diameter), DVI (doppler velocity index) and pAVG (peak aortic valve gradient) in surgically–treated patients, $p < 0.01$.

The incidence of the primary composite endpoint (death from any cause, non-fatal disabling stroke or non-fatal rehospitalization for AS) was significantly the highest in the OMT–group (94.9% vs. 32.9% and 34.6% for SAVR and TAVR, respectively, $p < 0.01$). Moreover, the occurrence of secondary endpoints was statistically significantly less frequent in the SAVR– and TAVR–cohorts than in the conservatively–treated patients ($p < 0.05$). Comparing only interventional strategies – TAVR–patients had lower rates of AKI (acute kidney injury), newly diagnosed AF (atrial fibrillation) and major bleeding (assessed as ≥ 3 according to the BARC scale (The Bleeding Academic Research Consortium)), $p < 0.05$. Conversely, the superiority of SAVR for major vascular complications and need for PP (permanent pacemaker) implantation was noticed, $p < 0.05$. However, no statistically significant differences between the SAVR– and TAVR–cohorts for primary and other secondary endpoints were observed. In-hospital mortality

did not differ between interventional strategies (6 (7.1%) vs. 20 (6.3%) for SAVR and TAVR, respectively, $p=0.80$), while the length of stay in the intensive care unit was significantly prolonged in surgically-treated patients (4.2 ± 3.7 days vs. 1.8 ± 3.8 days for SAVR and TAVR, respectively, $p<0.05$).

The quality of life (assessed using the SF-36 questionnaire) – both the PCS (physical component summary), MCS (mental component summary) and total did not statistically differ at the time of HT consultations ($p>0.01$), while at the end of the follow-up, patients who were treated conservatively assessed their quality of life – PCS, MCS and overall much worse than those treated surgically or percutaneously ($p<0.01$). There were no statistically significant differences in the quality of life between patients who underwent SAVR or TAVR.

In this article, we showed that after careful qualification and accurate implementation of decisions made by experienced HT, invasive strategies provide better long-term outcomes and improve the quality of life of patients with severe symptomatic AS.

In the next paper, we outlined the clinical and echocardiographic characteristics, the results of HT qualifications as well as the long-term outcomes and quality of life of patients with severe symptomatic mitral regurgitation (MR), who were assessed by members of HT, and then treated according to their decisions with: surgical mitral valve replacement (MVR) with optimal medical therapy – MVR+OMT, transcatheter edge-to-edge repair (TEER) using the MitraClip (MC) system with OMT – MC+OMT or only conservatively – OMT.

From 2016 to 2019, during 176 HT meetings, 254 patients with MR were discussed, and ultimately (having inclusion and exclusion criteria) 157 individuals with severe symptomatic MR treated according to HT decisions (MVR+OMT – 46 patients, MC+OMT – 58 patients or OMT – 53 patients) were included into final analysis. The mean follow-up period (SD) was 29 ± 15 months.

Regarding statistically significant differences in clinical characteristics, patients from the OMT-cohort were the oldest (73.7 ± 11.05 years), had the highest coincidence of diabetes (64.2%), AF (41.5%) and COPD (chronic obstructive pulmonary disease) – 43.4%, $p<0.05$; among patients qualified for MVR, the highest percentage of primary MR (56.5%) and the lowest periprocedural risk assessed according to the EuroSCORE II scale were found, $p<0.05$, while patients from MC-group were the most frequently burdened with concomitant CKD

(chronic kidney disease) – 94.8% and a history of previous CABG (coronary artery bypass grafting) – 29.3%; furthermore patients treated percutaneously had also the most severe symptoms of HF (assessed by NYHA scale), $p < 0.05$.

For all patients with severe MR presented within HT meetings, we have provided full echocardiographic data. Summarizing, individuals qualified for MVR, MC or OMT differed significantly in following parameters: LVEF – the highest in the MVR-cohort ($42.4 \pm 6.1\%$), LVEDD and ERO (effective regurgitation orifice area) – the lowest in the MVR-cohort (6.24 ± 0.65 cm [centimeter] and 0.37 ± 0.08 cm² [square centimeter], respectively) and mean MVG (mitral valve gradient) – the lowest in the MC-group (4.12 ± 1.41 mmHg), $p < 0.05$. The postoperative evaluation (after MVR or MC) showed significantly greater improvement in the percentage of degree of residual central regurgitation ≥ 2 and paravalvular leak and values of ERO, MR volume, maximum and mean MVG in the group of patients treated surgically as compared with MC ($p < 0.05$).

In-hospital mortality did not differ significantly between the groups qualified for interventional strategies (4 (8.7%) vs. 1 (1.7%) for MVR and MC, respectively, $p = 0.10$). The occurrence of the primary endpoint (death from CV cause) was the most frequent in the conservative cohort (20 (37.7%)), while in MVR and MC-groups – 7 (15.2%) and 10 (17.2%), respectively, $p = 0.01$. Moreover, for the secondary endpoints (death from any cause, non-fatal MI (myocardial infarction), non-fatal stroke, non-fatal hospitalization for HF exacerbation, or total CV events), MVR and MC proved their superiority as compared with OMT strategy ($p < 0.05$). The occurrence of primary and secondary endpoints did not significantly differ between interventional strategies (MVR and MC), $p > 0.05$.

The quality of life (assessed using the SF-36 questionnaire) – both the PCS, MCS and total did not statistically differ at the time of HT qualifications ($p > 0.05$), while at the end of the follow-up, patients from conservative group assessed their quality of life – PCS, MCS and overall as the worst ($p < 0.01$).

In this study, we also demonstrated a significant role of the HT for management of patients with severe symptomatic MR – careful evaluation and subsequent implementation of decisions made by an experienced HT members resulted in better outcomes and improved quality of life of invasively-treated patients.

The last original paper composing the series presents the results of our internal HT consultations in patients with advanced CAD (coronary artery disease) [defined as 3-VD (three-vessel disease) and/or multivessel disease equivalent – LMS (left main stenosis; defined as \geq 50% occlusion of left main artery)]; the clinical, echocardiographic and angiographic characteristics were outlined, and the incidence of complications, outcomes and the quality of life of participants were assessed.

From 2016 to 2019, 1509 patients with CAD were presented during 176 HT meetings, and ultimately (excluding patients who did not meet the criteria of the study) 1286 individuals with severe CAD (3-VD and/or LMS) were included in the final analysis. Patients were qualified according HT decisions for three main strategies as follows: surgical – CABG with OMT – CABG+OMT (356 patients), percutaneous – percutaneous coronary intervention (PCI) with OMT – PCI+OMT (679 patients) or conservative – OMT (251 patients). The primary composite endpoint was defined as MACCE (major adverse cardiac or cerebrovascular events) – death from any cause, MI, stroke or repeat revascularization. The above components considered separately, as well as composite of death from any cause, MI or stroke, CV death, in-hospital mortality, disabling stroke, and additionally – for interventional strategies: stent thrombosis or graft occlusion were defined as secondary endpoints. The mean follow-up (SD) for this group was 37 ± 14 months.

Nearly 41% of the patients consulted during HT meetings were hospitalized with a diagnosis of ACS (acute coronary syndrome): STEMI (myocardial infarction with ST-segment elevation), NSTEMI (myocardial infarction without ST-segment elevation) or UA (unstable angina); 3.4% were in cardiogenic shock, and the rest had diagnosis of chronic coronary syndrome. Statistically significant differences in the clinical characteristics of patients were found – individuals qualified by HT only for conservative treatment were the oldest (72.5 ± 9.9 years) and nearly 2/3 of them were frailty, $p < 0.01$. Moreover, patients from the OMT-cohort most often: had the diagnosis of HF (92%) and presented with symptoms of severe symptomatic HF in class NYHA III-IV (51.4%), severe left ventricular systolic dysfunction – LVEF $< 30\%$ (57%) and significantly increased LVEDD (6.2 ± 1.0 cm). Furthermore, they were most frequently burdened with AF (37.8%), CKD (76.9%), anemia (62.5%), severe PH (pulmonary hypertension) – 13.9% and a history of cancer (35.5%). Perioperative risk assessment according to EuroSCORE II and STS scales also showed the highest values in these patients, $p < 0.01$.

For patients with severe CAD we also collected a detailed angiographic data, as each patient had coronary angiography. Summarizing, participants treated with CABG or PCI had greater

number of affected coronary lesions (4.2 ± 1.4 and 4.3 ± 1.5 for CABG- and PCI-arm, respectively vs. 3.8 ± 1.4 in the OMT-group, $p < 0.01$) and more frequently LMS (30.6% and 23.3% for CABG and PCI, respectively vs. 18.3% in OMT-cohort, $p < 0.01$). It is need to highlight that although the patients qualified by HT for conservative management as the only form of treatment were the most burdened clinically, the complexity of CAD assessed by angiography was the highest in patients qualified for invasive strategies. Complete revascularization was achieved in a greater percentage of patients in the CABG-group than in the PCI-arm (65.4% vs. 58.5%, $p < 0.01$).

The occurrence of primary composite endpoint was most frequently observed in the OMT-cohort (154 (61.4%) patients vs. 110 (30.9%) and 302 (44.5%) in CABG and PCI, respectively, $p < 0.01$). Excluding in-hospital mortality (which was the highest (but not statistically significant, $p = 0.68$) in the OMT group) and repeat revascularization (10.7% and 24.3 % for CABG and PCI, respectively vs. 7.6% in OMT-patients, $p < 0.01$), invasive strategies had a lower incidence of all other secondary endpoints as compared with conservative management ($p < 0.01$). Comparing only interventional treatment, CABG was associated with a lower rates of MACCE and repeat revascularization, while patients treated with PCI experienced less strokes or disabling strokes ($p < 0.01$). Regarding the remaining secondary endpoints, there was no advantage of any of interventional strategies.

Quality of life of patients (assessed using the SF-36 questionnaire) – both the PCS, MCS and total did not significantly differ in the CABG-, PCI- and OMT-cohorts within HT consultations ($p > 0.05$), while at the end of the follow-up, patients treated surgically assessed their quality of life – physical, mental and total – as the highest, while in the PCI and OMT groups, respectively, worse and the worst results were obtained ($p < 0.01$).

In this study, we showed that for individuals with severe CAD, the implementation of well-thought-out by HT and then carefully implemented invasive strategies prolongs life, improves its quality and reduces the risk of serious complications.

In the last article in the series – a state of art – the most comprehensive summary of studies, reports and publications available in the literature and regarding the HT issue in the context of cardiological patients (with CAD, AS or MR) was presented. This manuscript also highlights the importance of the individualized HT approach to each patient, emphasizing that

it is the key to success in treatment and improving the quality of life of complex and highly burdened patients.

The presented series of articles regarding the results of HT qualifications in tertiary cardiovascular care center has several strengths that should be highlighted here. Firstly, the group of 1,925 patients with severe CAD, AS or MR is the most numerous in Poland and one of the most abundant among the articles and reports regarding HT issue that can be found in the literature; and it is worth emphasizing that these data come from only one cardiology center. Moreover, the follow-up is long enough to draw conclusions that can be usefully translated into real-life clinical practice. Finally, the innovation in the presented studies is the assessment of the quality of life of patients treated following HT decisions. It is a priceless clinical guideline for HT specialists, believed to improve the quality of decisions-making process in the future, and, to the best of my knowledge, so far assessed for the first time in the literature on this subject.