



Observed versus predicted 6MWT distance

(95% CI: -7.74 to 7.55). A plot showing the observed versus predicted 6MWT distance is presented in Figure.

Conclusion: The developed predictive model could be a useful tool to identify those patients with suboptimal gain in functional capacity, who should be targeted for individualized intervention. Further prospective study is warranted to validate proposed model.

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Preoperative exercise trainings as a method of cardioprotection in patients referred to coronary artery bypass grafting

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Purpose: To evaluate the effectiveness of high intensity prehabilitation in preparation of patients with coronary artery disease (CAD) for elective on-pump coronary artery bypass grafting (CABG) from the perspective of cardioprotection.

Methods: 38 male patients with stable CAD referred to on-pump CABG were included in the study. All patients were assigned into two groups based on the preoperative management. Group 1 patients (n=20, the mean age 57.9±7.15 years) underwent high intensity treadmill exercises. Group 2 patients (n=18, the mean age 60.4±7.01 years) underwent routine preoperative management without prehabilitation. Treadmill exercises in Group 1 patients were performed under hemodynamic control and ECG monitoring (30 minute workouts per 1 day for 7 days). The training power of workout was calculated based on cardiopulmonary exercise test performed before preoperative exercises, and was estimated as 80% of the maximal power obtained during the exercise test. Adenosine loading single-photon emission computed tomography (SPECT) was used to measure the parameters of myocardial perfusion before preoperative exercises and on days 5–7 after CABG in both study groups. Myocardial perfusion was assessed using the QPS program (Cedars Sinai Medical Center (USA)) with the construction of 17 segment polar map. All patients underwent direct myocardial revascularization under extracorporeal circulation. Statistical analysis was performed using the Statistica 8.0.

Results: Both study groups were comparable in the main clinical and demographic as well as main intraoperative clinical. Moreover, the parameters of the cardiopulmonary exercise test and SPECT were similar in both study groups. There were no cases of complications during prehabilitation. All patients had good exercise tolerance. The following parameters were assessed: the rate of accumulation of radiopharmaceutical in each sector (%), as well as integral indices of myocardial damage: SRS (Summed Rest Score) - the sum of individual scores during rest, SSS (Summed Stress Score) - the sum of scores characterizing the extent and severity of stress perfusion abnormality, SDS (Summed Difference Score) - the sum of scores representing the extent and severity of stress-induced ischemia. The analysis of myocardial perfusion parameters demonstrated that patients who had undergone prehabilitation had significantly higher accumulation of radiopharmaceutical than those in the control group in basal segments (74.9±3.98% vs. 70.3±7.40% p=0.04), middle (86.7±5.24% vs. 79.6±10.43%, p=0.03) and apical (85.8±5.03% vs. 79.0±8.67%, p=0.02) myocardium. The stress-induced ischemia (SDS) was less pronounced in Group 1 compared to Group 2 (0 scores and 0.9±0.53 scores, respectively, p=0.04).

Conclusion: The inclusion of high intensity preoperative exercises in the routine preoperative management of patients referred to elective CABG improves myocardial perfusion in the postoperative period.

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Cardiac rehabilitation (CR) derived survival predictors in patients after transcatheter aortic valve implantation (TAVI)

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Purpose: Evaluate exercise-based residential CR derived outcome predictors in patients referred after TAVI.

Methods: From January 2010 to January 2014, 95 consecutive TAVI patients (65% female, age 82±4years, 45 Edwards, 50 CoreValve) were referred to a 3-week intensive CR programme (walking, up to 30 minutes of cycling or treadmill session twice daily, respiratory training). Assessments that have taken place: Comorbidity (cumulative illness rated state-comorbidity index) (CIRS-CI) score, Echocardiography on admission, Disability (Barthel Index) (BI) score, Morse Fall Scale score (MFS), six minutes walking test distance (6MWT) on admission and on discharge; patients able to tolerate, by the end of CR, an exercise workload (EW) greater than the Median of workload tolerance were categorized as FIT. Disability at discharge was categorized as severe (BI <60), moderate (BI 60–89) or mild (BI >90).

Results: At three years follow up there were 35 (37%) deaths; medians EW by the end of CR were 10W and 1 Km/h respectively for exercise bicycle and treadmill. At univariate Cox analysis CIRS CI (p=0.014), BI score (p=0.0001), Creatinine level (p=0.01), 6MWT (p=0.015), MFS score (p=0.013) and "FIT" category (p=0.006) were predictive of survival at follow up.

At multivariate analysis BI score at discharge (p=0.001, CI=0.96–0.98), EW tolerance ("FIT" or "Not FIT") (p=0.01, CI=0.09–0.7) and creatinine level at discharge (p=0.03, CI=1.3–3.8) confirmed their outcome prediction power.

At Kaplan-Meier survival analysis disability categories (BI<60, 60–89, >90) (Log-rank p<0.05) and EW tolerance categories ("FIT", "no FIT") (Log-rank p<0.01) clearly differentiated survival probability at follow up stage.

Conclusions: EW tolerance and disability profile measured in TAVI patients at discharge from residential CR independently predict risk of death at long term follow up.

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A novel scoring system and decisional algorithm to predict functional recovery after heart valve surgery

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Background: Current guidelines underline the importance of cardiac rehabilitation (CR) after heart valve surgery. However, there is only a limited number of randomised clinical trials on this type of patients and guidelines are currently based on results from randomised clinical trials on CR for functional improvement in patients with coronary artery disease (CAD) and congestive heart failure (CHF). Moreover, the role of CR as a phase of monitoring and management of major post-surgical complications should not be underestimated.

Purpose: The aim of this study is to evaluate predictors of Functional Recovery (FR) and of development of major complications during rehabilitation (MaCCR).

Methods: We studied 596 patients who underwent heart valve surgery and were subsequently hospitalized in our CR unit. We divided patients in groups according to the FR and MaCCR development. In particular, FR was defined as a relative improvement of ≥75% between treadmill-modified 6-minute walking tests (6MWTm) performed at admission and at discharge from the CR unit. MaCCR included anaemia requiring blood transfusions, sternal wound infection, pericardial effusion requiring pericardiocentesis and positive blood cultures.

Results: Multivariate Cox regression analysis showed that metabolic equivalents (METs) at the admission 6MWTm were the independent predictor of FR (p<0.001, OR 0.06). Besides, surgical complexity (p 0.003, OR 2.44), post-operative peak of High Sensitivity Cardiac Troponin T (p<0.029, OR 1.2) and the need for blood transfusions during Cardiac Surgery Department stay (p<0.001, OR 3.24) were independent predictors of MaCCR development. Based on the b coefficients obtained with the multivariate analysis, we created a risk model and a scoring system to stratify patients according to the probability of developing MaCCR. Patients with a score >7 were considered at high risk. This model and the METs data were integrated into a final algorithm (Figure 1) to suggest individualised programmes according to the possibility of different patients to reach FR and their probability of developing MaCCR. Through the algorithm, patients can be classified into nine different risk categories. Consequently, the cardiologist will be able to identify low-risk patients who require neither a specific physical rehabilitation nor the inpatient complications monitoring; on the other hand, high-risk patients will be considered for an extended inpatient rehabilitation period.

	SCORE 0	SCORE 1-6	SCORE ≥7
METs < 2.5	EXTENDED REHAB INPATIENT, OUTPATIENT	EXTENDED REHAB INPATIENT, EARLY DISCHARGE	EXTENDED REHAB INPATIENT
METs 2.5-3.5	STANDARD REHAB OUTPATIENT	STANDARD REHAB INPATIENT, EARLY DISCHARGE	STANDARD REHAB INPATIENT
METs > 3.5	OUTPATIENT MONITORING & FOLLOW-UP	OUTPATIENT AFTER CLINICAL EVALUATION	INPATIENT MONITORING

Figure 1

Conclusions: The validation of the scoring system and the functional algorithm is ongoing. They could be new, simple, but very important tools to organise post-surgical management to optimise the use of available resources and to obtain the best clinical outcome for patients with different characteristics.