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# Evaluation of the Relationship Between Preoperative Functional Capacity, Number of Clogged Vessels and Kinesiophobia Level in Postoperative Intensive Care and Hospital Stay in CABG Cases

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## Abstract

**Purpose:** In our study, we aimed to investigate the relationship between functional capacity, number of clogged coronary arteries, and kinesiophobia level in the Intensive Care Unit (ICU) and duration of total hospitalization in candidates with CABG surgery.

**Materials and Methods:** Our study was conducted with 34 patients with coronary artery disease in 18 to 65 years old treated between May 2017 and August 2017 in Ministry of Health Kartal Koşuyolu High Speciality Educational Training and Research Hospital in Cardiovascular Surgery Functional capacities of the cases were evaluated with the 6 Minutes Walking Distance (6MWD) Test, and the kinesiophobia levels were evaluated with the Tampa Scale of Kinesiophobia for Heart (TSKH).

**Results:** 4 (11.8%) of the cases who have the mean age 56, 76 ± 7, 21 were female and 30 (88.2%) were male. The mean value 6MWD of the patients was 463, 38 ± 88, 751 meters. Although there was no significant relationship between 6MWD and length of ICU stay (p = 0, 420), there was moderate negatively correlated with the mean duration of hospital stay (p = 0.16 r = -0.41). The mean score of the TSKH was 43, 12 ± 7. 99. There was a strong negative correlation between the TSKH score and 6 MWD (p = 0, 000 r = 0, 778). Duration of intensive care unit =0,445 (number of clogged vessels)+1.080 was found in multiple line arregression analyses (p=0.035; $R^2$=0,132 F=4,854). According to the other regression model, functional capacity= 862,908 – TSKH score (8,111) - CCS (27,763) ($R^2$ = 0,709; p = 0.001; F = 37,679).

**Conclusion:** In our study, it was concluded that preoperative evaluation of functional capacity is associated with the duration of hospitalization in postoperative CABG cases and the number of clogged vessels is the predictor of the length of intensive care unit stay. We suggest that functional capacity should be evaluated pre-operatively and postoperative patient-centered cardiac rehabilitation approaches may apply to improve functional capacity and provide the graft patency effectively.

**Keywords: Coronary artery bypass graft; 6MWD; Functional capacity; Number of graft; Tampa kinesiophobia scale; Hospitalization**

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## Introductıon

Cardiovascular diseases, a leading public health problem, are a global cause of death. In 2013, it caused more than 17 million deaths. In 2030, these deaths are expected to exceed 23.6 million [1]. It is indicated in cases where Coronary Artery Bypass Grafting surgery (CABG) decrease in left main coronary flow, stenosis in three arteries affecting left ventricular functions, multi-vessel occlusion including LAD stenosis and in cases of unstable angina when symptoms cannot be controlled and myocardial infarction is seen [2]. Increased severity or combination of said clinical conditions increases the risk of complications in the postoperative period. However, the cardiopulmonary bypass technique used in coronary bypass surgery increases the systemic inflammation response, suppresses the immune system and impairs the capillary permeability. Atelectasis, pleural effusion, pneumonia; acute kidney injury, neuromuscular disorders, postoperative hemorrhage and infection are the most common complications [3-5].

**Table 1:** Demographic and Medical Characteristics of the Patients.

| Number of patients | 34 |
|---|---|
| Gender n (%) | 4 females (11.4%) |
| | 30 males (88.2%) |
| Average age, year + S. D | 56. 76 ± 7. 21 |
| Male, year + S.D | 56. 40 ± 7. 44 |
| Female, year +S.D | 56. 50 ± 4. 93 |
| Body height average, cm + S. D | 167. 53 ± 6. 425 |
| Body weight average, Kg + S. D | 80. 35 ± 12. 96 |
| BMI average, kg/ $m^2$ + S. D | 28. 57 ± 4. 12 |
| Presence of family history, n (%) | 21 (61. 8%) |
| HT | 19 (55. 8%) |
| DM | 17 (50%) |
| HDL, mg/dl+ S.D | 40.25± 9.05 |
| LDL, mg/dL+ S.D | 134.34± 69. 53 |
| Total Cholesterol, mg / dl + S.D | 192. 5 ±53. 75 |
| Triglycerides, mg / dl + S.D | 175± 78. 4 |
| Number of clogged vessels, mean ± S.D | 2.79± 0.91 |
| Ischemic cardiomyopathy | |
| (Heart failure, previous myocardial infarction, coronary stent) | 8 (23. 5%) |
| n (%) | |
| CKD | 2 (5. 8%) |
| EF average ± S. D | 57. 50 ± 9. 72 |
| Patients without angina, n (%) | 3 (8, 8%) |
| CCS - Class I, n (%) | 13 (38. 2%) |
| CCS - Class II, n (%) | 6 (17. 6%) |
| CCS - Class III, n (%) | 12 (35. 3%) |

S.D: Standard Deviation, HT: Hypertension, DM: Diabetes Mellitus, HDL: High Density Lipoprotein, LDL: Low Density Lipoprotein, CKD: Chronic Kidney Disease, EF: Ejection Fraction, CCS: Canadian Cardiovascular Society Angina Classification.

Excessive postoperative complications while increase mechanical ventilation time and sedation time; decreases mobility, muscle mass, and functional capacity prospectively. Possible consequences of decreased mobility and functional capacity may last for months or even years after intensive care unit and discharge from the hospital [6]. The length of the intensive care stay and the duration of hospitalization should be taken as a basis for the patient to regain his or her daily life and to reduce the risk of re-admission to the hospital.

It has been demonstrated in clinical studies that exercise training has a direct curative effect on the pathogenesis of the CAD, improves functional capacity, decreases hospital admissions and increases survival of CABG patients [7-11]. Cardiopulmonary physiotherapy should start in the intensive care unit at the earliest possible time and should continue after discharge.

Another clinical dimension of the coronary artery surgery process is kinesiophobia caused by catastrophic interpretation of pain, which can be seen in patients with chronic pain. The idea that catastrophic interpretation leads to intolerance to physical activity/ exercise at a later time in the early stages of the disease was supported by a prospective study conducted by Sullivan et al. [12].

In this context, in our study we aimed to evaluate the effects of preoperative functional capacity, which has an important role in postoperative prognosis in CABG cases and kinesiophobia level and number of clogged vessels on postoperative length of intensive care unit stay and the duration of total hospitalization. The relationship between kinesiophobia level, clogged vessels numbers and functional capacity may affect the length of ICU stay and the duration of hospitalization after CABG surgery is still not known well. For this purpose, we planned our study may explain the relationship between these factors after CABG surgery, and its power.

**Table 2:** Correlation Coefficient of TSKH, CCS, EF and Clogged Vessels Number with 6MWD.

| Parameters | p and r values |
|---|---|
| TSKH | p = 0. 000 |
| | r =0. 778 |
| CCS | p = 0. 001 |
| | r = 0. 434 |
| EF | p =0. 436 |
| Number of clogged vessels | p=0,130 |

Significance value: $p < 0.05$
TSKH: Tampa Scale of Kinesiophobia for Heart.

## Materials and Methods

### Study Cases

Between the dates May 2017 - August 2017, 118 patients treated in Ministry of Health Kartal Koşuyolu High Speciality Educational Training and Research Hospital in Cardiovascular Surgery were evaluated and 34 cases with CAD were included in the study. It is started after obtaining the ethical approval of Republic of Turkey, Marmara University Faculty of Medicine, Clinical Research Ethics Committee (Protocol No. 09. 2017. 259.).

Criteria for inclusion in the study are to have coronary artery disease and be a candidate for coronary artery bypass surgery, being between the ages of 18-65. Exclusion criteria were history of myocardial infarction in the past month, taking place in Class IV according to Canada Cardiovascular Society (CCS) angina classification system, systolic blood pressure value greater than 180 mmHg or diastolic blood pressure value greater than 120 mmHg, 2nd or 3rd atrioventricular block, arrhythmia, and the patients have the neuromusculoskeletal problems that prevented walking.

### General Assessment and Measurements

Demographic characteristics (age, gender, height, body weight, Body Mass Index (BMI)), anamnesis (history, family history, blood lipid profile, medication), and symptoms related to the disease (evaluation of angina according to CCS) of the cases were recorded. Postoperative length of intensive care unit stay and the duration of total hospitalization were noted.

### Assessment of Kinesiophobia

The kinesiophobia levels of the patients were evaluated with Tampa Scale of Kinesiophobia for Heart (TSKH) which is the validity and reliability study of Turkish version performed by Acar et al. [13].

Tampa Scale of Kinesiophobia for Heart is a 17-item scale measuring the level of kinesiophobia and exercise avoidance behavior associated with cardiac disease 4-pointlikert type (1 = Strongly disagree, 4 = Strongly agree). The lowest score that can be obtained from TSKH is 17 and the highest score is 68. The total score was used in our study and the limit value for high kinesiophobia was accepted

**Table 3:** Correlations of Patients with Length of ICU Stay and Duration of Total Hospitalization Time with Clinical Data.

| Parameters | 6MWD | Number of clogged vessels | EF | CCS | TSKH Score |
|---|---|---|---|---|---|
| Length of ICU Stay | p=0,420 | p= 0,046* | p=0,68 | p=0,554 | p=0, 884 |
| | | r= 0,35 | | | |
| Duration of Total Hospitalization | p=0,16* | p=0,043* | p=0, 86 | p=0, 18 | p=0, 17 |
| | r= -0,41 | r= 0,35 | | | |

Significance value: p<0.05.

**Table 4:** Regression Analysis of Variables Associated with Length of ICU Stayand Duration of Total Hospitalization.

| $R^2$ | Model | Unstandardized Coefficients | | Standardized Coefficients | t | p |
|---|---|---|---|---|---|---|
| | | B | Std. Error | B | | |
| 0,103 | 1. (Constant) Number of Obstructed Vessels | 10,907 | 3,134 | | 3,481 | ,001 |
| | | 2,044 | 1,067 | ,321 | 1,915 | ,065 |
| 0,363 | 2. (Constant) Numberof Obstructed Vessels | 1,080 | ,593 | | 1,821 | ,078 |
| | | ,445 | ,202 | ,363 | 2,203 | ,035 |
| 0,080 | 3. (Constant) 6MWD | 25,233 | 5,248 | | 4,808 | ,000 |
| | | -,019 | ,011 | -,283 | -1,671 | ,105 |

as 37 [14].

### Assessment of Functional Capacity

Functional capacity was assessed in accordance with the ATS 2002 criteria and standardization with the 6-min Walk Distance Test (6MWDT) [15]. For 6MWDT; a 30-meter corridor, Omron brand M2 model arm type digital blood pressure device, pulse oximeter and stopwatch were used to monitor hemodynamics and oxygen saturation values. Before 6MWDT, the test was explained to the patient in detail and the patient was rested for 15 minutes. Heart rate, blood pressure, oxygen saturation were recorded before the test. Fatigue level was assessed by Modified Borg Scale (0-10) [16].

### Statistical analysis

Data were evaluated using the SPSS 23. 0 package program. In the descriptive data, the number and percentage values were expressed in the categorical variables and the mean ± standard deviation was used to express the numerical data.

In the comparisons between the two groups, when the relationship between the quantitative variables was tested, the Student-t test was analyzed by Mann-Whitney U test if the data were suitable for normal distribution. In the investigation of the relationship between 6MWD, TSKH score, the number of obstructed vessels, and the length of intensive care unit and the duration of total hospitalization in patients, Pearson correlation was used if the data fit normal, analysis and if not Spearman's correlation was used. Multiple linear regression, odds ratio (OR) and 95% CI were used to define affecting factorson the duration of intensive care unit stay and duration of total hospitalization and affecting factors on functional capacity. Significance level was accepted as p <0.05.

## Results

We investigated the relationship between functional capacity, number of clogged coronary arteries, and kinesiophobia level in the Intensive Care Unit (ICU) and duration of total hospitalization in candidates with CABG surgery. A total of 34 patients were included in our study, 4 were female (11.8%) and 30 were male (88.2%). The mean age of the study group was calculated as 56.6 ± 7.21 years old. Demographic and medical data of the participants are given in Table 1.

The mean score of TSKH of 34 patients who participated in the study was 43.12 ± 7.99. The TSKH score of 29 of the patients (85.3%) was more than 37 and 5 (14.7%) was between 17 to 37. The gender-based distribution of the high TSKH score was as follows: The total number of female patients (100%) was higher than 37, while 25 (83.3%) of male patients had a TSKH score of more than 37. The mean value of the 6MWD was found as 463.38 ± 88.751 meters. 6MWD averages of patients without angina were calculated as 521.67 ± 99.289, the mean 6MWDs of CCS class I patients were 498, 31 ± 88, 752, and the mean 6MWDs of CCS class II patients 444 33 ± 59. 007; CCS class III patients had an average of 6MWD 420, 50 ± 84, 751. The correlations of TSKH, CCS, EF and number of obstructed vessels with 6MWD are shown in Table 2. Developed multiple regression model explained functional capacity =862,908 - TSKH score (8,111) - CCS (27,763) (R2 = 0,709; p = 0.001; F = 37,679). The mean length of intensive care unit stay after CABG surgery was 2, 32 ± 1.12 days (min 1-max 6 days). The mean duration of hospitalization was calculated as 16.62 ± 5, 82 at least 9 and maximum 36 days respectively. The length of intensive care unit stay and total hospitalization and correlation of clinical data were given in Table 3. In addition to the correlation analysis, Coxregression models were developed. It was found that the number of occluded vessels in Model 1 had an explanation of 13.2% on the duration of intensive care stay, and the model was found to be significant with 0.445 coefficient (p = 0.035; $R^2$=0,132 F=4,854). In the regression analysis, the number of obstructed vessels on duration of total hospitalization was 10.3%. However, the effect value of thevariable in model and model was not significant (p> 0.05 R2 = 0,103 F = 3,666). In the regression analysis, the effect of 6MWD on duration of total hospitalizationwas 8%, but it was not significant in model 3 (p> 0.005 R2 = 0.08 F = 2, 791). Regression analysis results are shown in Table 4.

## Discussion

In this research, we studied the relationship between functional capacity, number of clogged coronary arteries, and kinesiophobia level in the length of Intensive Care Unit (ICU) stay and duration of total hospitalization on patients with CABG surgery.

Recent studies in CABG surgery, which may be a complicated surgery in terms of postoperative care in complex patients, have

focused on reducing postoperative mortality, morbidity and the duration of hospitalization [17].

CABG surgery may prolong the intensive care period due to other complications such as respiratory system complications, especially in the early postoperative period; increase the duration of hospitalization, and cause morbidity and mortality. Reducing the length of stay in intensive care unit and duration of total hospitalization are extremely important in terms of both returning to the daily living activities as soon as the clinical recovery allows for the patient, and also improving her/his functionality safely. Most survivors of long-term intensive care can be morbid with low functional capacity, even mortal shortly after discharge from the hospital. Additionally, graft patency depends on progressive functional activities and increased effort capacity. Therefore, close follow-up is vital part of the bypass surgery during both the intensive care and the ward care periods in hospital [18]. As a result of our research, it was found that it is strongly negative with functional capacity with kinesiophobia level and negatively correlated moderate significantly with CCS angina score. This result may be attributed to the fear avoidance behavior associated with the pain-related activity decreased the functional capacity in the cases. Our study is also the first known study in the literature investigating the relationship between kinesiophobia level and functional capacity in pre-op CABG cases. In this respect, we think it carries an originality.

The 6MWD test, in which functional capacity is measured, is a test that provides a good response in the CABG surgery for adult and elderly patient groups and is consistent with the patient's clinic for the timing of discharge. In an associated meta-analysis study, it was shown that postoperative early mobilization protocols increase functional capacity and reduce hospital stay time [19].

Cacciatore et al. have conducted that >50% value of EF measured in the postoperative period in CABG cases and > 300 m score in 6MWD test are a marker of mortality [20].This results aged dependent; EF ≥ 50% is protective in adults but not in elderly (<65 years) while 6MWT ≥ 300 m is protective in elderly (>65 years) but not in adult patients. We have not founded correlate between EF, length of ICU stay and duration of hospitalization. Our population's mean of age was 56years and this result of our study were parallel to Cacciatore's study about EF. We think about the difference of between our result and Cacciatore's about 6MWD, our population's the mean age was smaller than the other.

Prior to cardiac surgery, in the study conducted with 122 elderly patients, the walking speed is slower than 5 m in 6 seconds, so increasing the time spent on walking it is reported there is associated with major morbidity and mortality high risk of intra-hospital complications after surgery and no association with mechanical ventilation time walking speed is a critical component of intensive care treatment [18,21]. We have not seen relationship between 6MWD and length of stay in ICU. These studies' results were parallel to each other.

Baptista et al. [17] founded that preoperative evaluation of 87 patients with CABG surgery 6MWD> 350 was associated with higher quality of life after post-op 2 months [17]. In our investigation, mean value of 6MWD was founded as 463 meters. Our patient's 6MWD is higher than Baptista et al. [17] study. The disagreement in the results can be justified by the difference in the number of cases and clinical status of patients and follow uptime. We evaluated in short term postoperatively, Baptista's et al. [17] was evaluated follow up 2 months.

In our study, it was determined that functional capacity was moderately correlated with the duration of total hospitalization. However in the regression analysis, functional capacity was not found to be a significant predictor of the duration of total hospitalization despite 8% explanatory in the model. We believe that further studies are needed in larger patient population examining the effect of functional capacity on length of ICU stay and the duration of total hospitalization. The number of obstructed vessels was the moderately correlated to the length of intensive care unit stay and the duration of total hospitalization in our study [22]. The number of obstructed vessels was also found to be an independent predictor in predicting the length of intensive care unit stay.

We assume that the preoperative angina severity and the level of kinesiophobia triggered by angina, which is not directly related to the length of intensive care unit stay and duration of total hospitalization time. It may link to improvement of myocardial oxygenation within effective bypass grafting procedure.

Consequently, in our study it was proved that number of obstructed vessels is functional to estimate the length of intensive care unit stay. We recommend preparation of favorable care plan after CABG surgery and to improve functionality of treatment programs as cardiopulmonary rehabilitation may be suggested considering increased respiratory complications associated with prolonged ICU admission.

## Conclusion

This study proved suitability of Turkish version of the Tampa Scale of Kinesiophobia for Heart for coronary bypass surgery patients used firstly. Also, it showed that preoperative evaluation of functional capacity is associated with the duration of hospitalization in postoperative CABG cases and the number of clogged vessels is the predictor of the length of intensive care unit stay. Further studies may be evaluated isolated analysis of the length of ICU stay and duration of total hospitalization factors in postoperative CABG cases.

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