Journal of Experimental and Clinical Medicine
https://dergipark.org.tr/omujecm

Clinical Research

J. Exp. Clin. Med., 2018; 35(1): 15-18
doi: 10.5835/jecm.omu.35.01.003

Hand preference in patients with acute coronary syndrome

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ARTICLE INFO

Article History

Received	01 / 12 / 2017
Accepted	03 / 06 / 2018
Online Published Date	25 / 10 / 2019

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Keywords:
Acute coronary syndrome
Angiography
Hand preference
Lateralization

ABSTRACT

The relationship between left-handedness and morbidity and mortality of some disorders has been extensively studied in recent years. We aimed to investigate whether a relation with coronary artery disease proven with angiography and hand preference exist or not. This is a prospective cross-sectional study including a total of 633 patients admitted to the ED. Hand preference was assessed using the Edinburg Handedness Inventory. Patients whose hand lateralization could not be evaluated via Edinburg Handedness Inventory and whose coronary angiography detection were unable were excluded. All patients with angina pectoris admitted to ED were evaluated via current guidelines. Selective left and right coronary angiography was performed and the lesion severity and coronary anatomy were evaluated. A total of 633 patients were included in the study. Edinburg handedness inventory assessment showed that of the study population, 93.2 % was right-handers and 6.8% was non-right handers. For the patients ≥65 years, the ratio of right handers in patients with angiographically proven coronary artery diseases were markedly higher compared to patients with non-right handers.Physicians should give attention to this situation while evaluating coronary angiographies. Non-right handedness seems to have a protective affect against CAD in the elderly.

1. Introduction

Individuals can have either a weak or a strong preference for the contralateral hand. However, the left hand is consistently preferred only by a small percentage of individuals (about 12% of males and 8 – 10% of females) when performing a range of everyday tasks (Gilbert and Wysocki, 1992; Annett, 2004; Papadatou-Pastou et al., 2008). Left handers who show a mixed pattern, using their right hand for some activities and the left for others, are said to have a weak or mixed hand preference.

In recent years, there have been extensive studies of the association between left handedness and morbidity and mortality in various disorders, such as attention deficit disorder, Alzheimer's disease (cognitive deficits) and sleep apnea (Hoffstein et al., 1993; Doody et al., 1999). However, the notion of reduced longevity in left-handers has been disputed (Hoffstein et al., 1993; Doody et al., 1999).Thus, the aim of the present study was to investigate the potential relationship between hand preference and angiography-proven coronary artery disease (CAD).

2. Materials and methods

Study design and population

This was a prospective cross sectional study of 633 patients aged more than 18 years who were admitted to the emergency department (ED) between 10

September 2013 and 10 August 2014 with a suspicion of acute coronary syndrome. Patients were excluded whose hand lateralization could not be evaluated via the Edinburg Handedness Inventory (Alzheimer's, demans, mental disorders) and coronary angiography detection were unable (n =17, n =42, respectly). The study was approved by the local ethics committee (Reg. no:B30.2.ATA.0.01.00/165).

The Edinburg Handedness Inventory was used to assess hand preference (Oldfield 1971). Subjects with handedness scores of over + 40 were considered right-handers, and those with scores lower than - 40 were considered left-handers. Subjects with scores between -40 and + 40 were considered ambidextrous. According to the Edinburg Handedness Inventory scale, 33 patients were left handers, and 10 were ambidextrous. In the study, the left handers and ambidextrous patients were combined to aid the statistical analyses.

All the patients with angina pectoris who were admitted to the ED were evaluated according to current guidelines (Langorgen et al., 2014). ST segment elevation myocardial infarction (STEMI) was defined as a ST segment elevation in two contiguous precordial leads (in V2-3, ≥ 2 mm for men and 1.5 mm for women; ≥ 1 mm in other leads) or new onset presumed left bundle branch block. Non-STEMI was defined as troponin exceeding the 99th percentile of a normal reference population (> 0.06 ng/ml for troponin I in our laboratory) and having at least one of the following: ischemic symptoms, electrocardiographic changes in the ST segment or T-wave, or evidence of new loss of viable myocardium on imaging. Unstable angina was defined as ischemic symptoms without troponin elevation, ST segment or T-wave changes in electrocardiography, or evidence of new loss of viable myocardium on imaging.

All the coronary angiography procedures were performed using the femoral artery route. Selective left and right coronary angiography was performed, and the severity of the lesion and coronary anatomy were evaluated. Coronary lesions from at least two nonforeshortened angiographic views were evaluated. Angiographic CAD was defined as more than 50% stenosis in major epicardial coronary arteries and was graded as one vessel, two vessel, or three vessel disease.

Statistical analysis

Numeric variables were expressed as the mean ± standard deviation, and categorical variables were given as percentages. The distribution of numerical variables was assessed using the Kolmogorov Smirnov test. In comparing the right and left handed groups, a Student's t-test was used for normally distributed numerical variables, and the Mann–Whitney U test was used for non-normally distributed numerical variables. A chi square test was used for categorical variables. A p value of < 0.05 was accepted as statistically significant. All statistical analyses were done by SPSS 20.0 (SPSS Inc., Chicago, IL) for Windows.

3. Results

The study consisted of 633 patients (mean age, 61.1 ± 12.2; 74.2%, male). The diagnoses of the patients were as follows: 26.7% STEMI, 24.1% Non-STEMI, and 49.2% unstable angina pectoris. The coronary angiography results revealed normal coronary arteries in 28.4%, single vessel disease in 35.5%, two vessel disease in 20.4%, and three vessel diseases in 15.6% of cases. The Edinburg Handedness Inventory assessment showed that 93.2% of the population were right handed and that 6.8% were nonright handed (5.2% left handed and 1.6% ambidextrous). In the group with normal coronary arteries, the ratio of left handers was 10%, whereas the ratio was 6.8% among patients with at least one vessel disease ($p = 0.131$) (Table 1).

Table 1. Baseline characteristics and coronary angiography results of patients according to the hand preference. Results are n (%), mean ± standard deviation, or median (interquartile range).

	all patients n:633	right handers n:586	nonright handers n:47
Baseline characteristics			
Age, years	61.1±12.2	61.3±12.4	58.6±10.6
Male/female	470/163	431/155	39/8
Coronary angiography			
normal coronary arteries	28.4%	27.6%	38.3%
single-vessel disease	35.5%	35.7%	34%
two-vessel diseases	20.4%	21.2%	10.6%
three-vessel diseases	15.6%	15.5%	17%

In the group with proven angiographic CAD, there were more right handers than in the group with normal coronary arteries, with statistically borderline significance (94.3% vs. 90.6%, $p = 0.095$, OR = 0.58, 95% CI 0.31–1.10). Nevertheless, no relationship was found between hand preference and the severity of angiographic CAD (no disease, single vessel, two vessel, and three vessel: 90.6%, 93%, 97%, and 88%, respectively; $p = 0.161$).

After categorizing the study population according to age (older age, ≥ 65 years), the analyses for hand preference were repeated (Table 2). Accordingly, for patients of < 65 years, the incidence of right handers did not differ between patients with and without angiographically proven CAD (92.1% vs 92.9%, $p = 0.793$, OR = 1.11, 95% CI 0.49 – 2.52). In the same age group, the relationship between the severity of angiographically proven CAD and hand preference was comparable (no disease, single vessel, two vessel, and three vessel: 92.9%, 90.9%, 95.4%, and 91.1%, respectively; $p = 0.694$).

Table 2. Baseline characteristics and coronary angiography results of patients according to the age group. Results are n (%), mean ± standard deviation, or median (interquartile range).

	<65, n:384	≥65, n:249
Baseline characteristics		
Age, years	53.5±8.6	72.9±6.3
Male/female	295/89	175/74
Coronary angiography		
normal coronary arteries	33.1%	21.3%
single-vessel disease	37.5%	32.5%
two-vessel diseases	17.7%	24.5%
three-vessel diseases	11.7%	21.7%

However, for the patients of ≥ 65 years, the ratio of right handers was markedly higher in those with angiographically proven CAD than the ratio of left handers (Table 3). Similarly, a significant relationship was found between hand preference and the severity of angiographically proven CAD (no disease, single vessel, two vessel, and three vessel: 84.9%, 98.7%, 98.4%, and 92.5%, respectively; p = 0.003).

Table 3. Coronary angiography results of over 65 years old patients according to the hand preference. Results are n (%), mean ± standard deviation, or median (interquartile range).

	right handers n:233	nonright handers n:16
Baseline characteristics		
Age, years	73.2±6.2	69.9±5.1
Male/female	162/73	14/2
Coronary angiography		
normal coronary arteries	19.1%	50%
single-vessel disease	33.2%	18.8%
two-vessel diseases	26.4%	6.3%
three-vessel diseases	21.3%	25.0%

When the analyses of hand preference were reanalyzed according to gender, the results revealed no relationship between the existence of CAD and hand preference or the severity of angiographically proven CAD and hand preference.

4. Discussion

Previous studies indicated on the relationship between lateralization and testosterone, a sex hormone that is believed to play a role in heart disease (Lalumière et al., 2000; Tan and Tan, 2001). According to earlier research, androgen levels could explain the protective effect of left handedness against CAD, especially in the elderly (Lalumière et al., 2000). However, debate continues about the effect of this hormone on heart disease, with some studies reporting that the levels were lower in left handers compared to right handers and others claiming that they were higher (Lalumière et al., 2000; Tan and Tan, 2001; Schwarcz and Frishman, 2010). Indeed, population studies reported a rise in all cause and cardiovascular mortality in patients with low testosterone levels (Ponikowska et al., 2010) and within a population of male patients with proven CAD (Malkin et al., 2010). As we did not measure the testosterone levels of patients in the present study, we are unable to express an opinion about whether this hormone has a protective effect against cardiac disease. Further studies of hand preference, cardiac arteries, and blood testosterone levels are needed to shed light on this issue.

Genetic factors and the early fetal environment are both thought to contribute to phenotypic variations in hand preference (Daniel and Yeo, 1993). In some individuals, developmental instability and pathological consequences of obstetric complications or early cerebral insults were reported to be responsible for an increased preference for the left hand (Rasmussen and Milner, 1977; Daniel and Yeo, 1993). Stellman et al. (1977) reported a diminishing percentage of left handers in older age groups. The coronary angiography results of our patients revealed normal coronary arteries in 28.4%, single vessel disease in 35.5%, two vessel disease in 20.4%, and three vessel diseases in 15.6% of cases. Our patients were 93.2% right handed and 6.8% nonright handed. We have detected in this study that left handedness seemed to confer a protective effect against CAD, especially among those older than 65 years.

Zamrini et al. (1990) reported a significantly increased prevalence of left handedness in elderly people with heart disease and provided considerable evidence of shorter longevity among left handers that appeared to be associated with increased heart disease. The results of the our study demonstrated that angiographically proven CAD was significantly higher in right handers older than 65 years and that there was no correlation with the severity of CAD and hand preference in any group. The strong points of this study are the large patient population and the detection of CAD via angiography, which is accepted as the gold standard.

According to Zamrini et al. (1990) cerebral dominance may contribute to differences in the cardiovascular responses of right-handers and left handers to autonomic stressors. In that study, the right hemisphere was associated with chronotropic effects on the heart, as well as with sympathetic activation (Rasmussen et al. 1977; Zamrini et al., 1990). The opposite was found in our study of an elderly population, with left handed patients having fewer coronary occlusions on angiography than right handed patients.

Consequently, in patients aged 65 years and older, the probability of detecting a lesion in coronary angiography was higher in patients with right hand predominance compared to those with left hand predominance. Physicians should pay attention to the handedness of patients when evaluating coronary angiographies. Left handedness seems to have a protective effect against CAD in the elderly.

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