Original Article

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Evaluation of Coronary Artery Disease in Patients with Atypical Chest Pain Based on Exercise Test

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ABSTRACT

BACKGROUND AND OBJECTIVE: Acute chest pain is caused by different reasons and about 20% of them are caused by myocardial ischemia. Since the number of patients with chest pain admitted to emergency wards is daily increasing, the present study was conducted to compare the exercise test results with coronary angiography in patients with atypical chest pain.

METHODS: This cross-sectional study was conducted among patients with acute chest pain in Babol from 2007 to 2009. Exercise tests were run for patients and if the result was positive, coronary angiography was performed and they were compared.

FINDINGS: 779 patients (394 males, 385 females) over 45 years with atypical chest pain underwent exercise test and the result was positive for 256 patients. 105 females and 151 males with positive exercise test results as well as patients with negative exercise test results underwent coronary angiography. Of 580 patients who underwent coronary angiography (256 patients with positive exercise test results and 324 patients with negative exercise test results), 276 patients (47.5%) suffered from coronary artery disease (CAD) and the prevalence of coronary artery disease (CAD) was 77% in patients with positive exercise test results and it was 24% in patients with negative exercise test results.

CONCLUSION: Considering the high prevalence of coronary artery disease (CAD) in patients with positive exercise test results, this test is recommended as a primary detection method for patients with atypical chest pain.

KEY WORDS: *Chest pain, Atypical chest pain, Coronary artery disease, Exercise test.*

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Introduction

Chest pain is still a big challenge for physicians the number of patients with chest pain admitted to emergency wards is increasing. Chest pain is highly significant because it may lead to death in a very short period. Recent improvements has led to better and faster diagnosis in cardiovascular patients. Chest pain is caused by different reasons and about 20% of them are caused by myocardial ischemia (1).

Ischemic heart diseases are the most important causes of death and disabilities in developed countries and impose high costs on the society. More than 12 million people in USA suffer from ischemic heart disease. The most common cause of myocardial ischemia is the formation of atherosclerotic plaques in coronary arteries.

In case plaque narrows the blood vessel by more than 50%, chest pain is felt during physical exercise and if the vessel is narrowed by more than 75%, chest pain is also felt at the time of rest. Chest pain is divided into three categories: Typical chest pain: in men above 45 years, 90% of patients and in women above 45 years, 70% of patients suffer from coronary artery disease.

Atypical chest pain: nonanginal chest pain: three criteria are considered for identification of chest pain (Retrosternal Chest Pain):

A. Chest pain behind the sternum, B. Chest pain with activity, C. Pain relief with rest or sublingual tablets. If all the tree criteria are present, the chest pain is typical. If two criteria are present, the chest pain is atypical. If one criterion is present, it is nonanginal chest pain (2, 3). In this study, atypical chest pain was assessed in men and women above 45 years old and the prevalence of coronary artery disease was assessed in this group using exercise test and coronary angiography.

Methods

This cross-sectional study was conducted among patients (above 45 years old) with atypical chest pain who referred to the hospitals and private clinics from 2007 to 2009. After obtaining informed written consent from patients, exercise test started with treadmill. Patients who were above 45 years and had typical chest pain were excluded from the study. Patients without contraindication for exercise test underwent tests with treadmill, among which 256 patients had positive exercise test, which included 105 women and 151 men. After obtaining informed written consent from patients, they underwent coronary angiography and the prevalence of coronary artery disease was studied. Of all patients with negative exercise test, 324 patients underwent coronary angiography and the other patients did not consent to do an angiography. The results were analyzed using SPSS statistical software and $p<0.05$ was considered significant.

Results

Several patients with chest pain referred to the hospitals and private clinics from 2007 to 2009, among which 779 patients (394 men and 385 women) with atypical chest pain were examined and underwent exercise test. Of these patients, 256 patients including 105 women with mean age of 57.45±12.7 years and 151 men with mean age of 60.40±11.2 years had positive exercise test.

Of 580 patients with atypical chest pain, 276 patients (47.5%) suffered from coronary artery disease according to coronary angiography. Of 276 patients with positive coronary artery disease, 93 patients (39%) were women and 183 patients (53.5%) were men. Of 256 patients with positive exercise test, 197 patients (77%) including 71 women and 126 men suffered from coronary artery disease according to coronary angiography.

Of 324 patients with negative exercise test, 102 patients were men and 132 patients were women and overall, 79 patients with negative exercise test suffered from coronary artery disease (24%) including 57 men (29.5%) and 22 women (16.5%) (Table 1, 2 & 3).

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Table 1. Angiography and exercise test results in patients with atypical chest pain

Negative exercise test N(%)	Positive exercise test N(%)	Total angiographed patients N(%)	
324(56)	256(44)	Total: 580(100)	Total angiographed population with atypical chest pain: 580(100)
192(59)	151(59)	Men: 343(59)	
132(41)	105(41)	Women: 237(41)	
79(24)	197(77)	Total: 276(48)	Patients with coronary artery disease: 276(47.5)
57(29.5)	126(83.5)	Men: 183(53.5)	
22(16.5)	71(67.5)	Women: 93(39)	
245(70.5)	59(23)	Total: 304(52)	Patients with normal coronary: 304(52.5)
135(70.5)	25(16.5)	Men: 160(46.5)	
110(83.5)	34(32.5)	Women: 144(61)	

Table 2. Atypical patients and exercise test

Normal N(%)	Coronary artery disease N(%)	Angiographed patients	Negative exercise test	Atypical
245(76)	79(24)	324	519	Total: 779
135 (70.5)	57(29.5)	192	243	Men: 394
110 (83.5)	22(16.5)	132	276	Women: 385

Table 3. Sensitivity, specificity, positive and negative likelihood ratio.

	Sen: CI-95%	SP: CI-95%	PPV: CI-95%	NPV: CI-95%	LR + CI-95%	LR - CI-95%
Total	71(66–77%)	81(76–85%)	77(72–82%)	76(71–80%)	3.68(2.89–4.68)	0.36(0.29–0.43)
Men	69(62–76%)	84(79–90%)	83(78–89%)	70(64–77%)	4.41(3.03–6.40)	0.36(0.29–0.46)
Women	76(68–85%)	76(83–69%)	63(59–77%)	83(77–90%)	3.23(2.36–4.43)	0.31(0.21–0.45)

Discussion

Results of the study demonstrated that the prevalence of coronary artery disease in the total population with atypical chest pain (above 45 years old) is about 47.5%, out of which 53.5% were men and 39% were women, while the difference between the two genders was not significant. Of the total studied population, 32% had positive exercise test, out of which 38% were men and 28% were women. Of 256 patients with positive exercise test, 197 patients (77%) suffered from coronary artery disease according to angiography. In men and women with positive exercise test, 83.5% and 67.5% suffered from coronary artery disease, respectively.

Of 324 angiographed patients with negative exercise test, 29.5% of men and 16.5% of women suffered from coronary artery disease. In a study by Gehrie et al. among patients with atypical chest pain, 10% of patients suffered from non-obstructive coronary artery disease (4). In a study by Hwang et al. among 138 patients with atypical chest pain, the prevalence of coronary artery disease was 42% (5). The prevalence was higher in our study (47.5%). In a study by Kreatuse et al., the possibility of severe coronary artery disease in women was reported to be less than men (22.3% vs. 36.5%) (6). The prevalence of severe coronary artery disease in our study was also more among men. In a study by Bhardwaj et al. among 33 patients with atypical chest pain, the prevalence of coronary artery disease was reported to be 6% (7). In a study by Bonello et al. among 323 women with atypical chest pain, 67% of patients suffered from coronary artery disease according to angiography (8). McNeer JF et al. and Alexander KP et al. reported similar results in their studies (9, 10). Our study also reported lower prevalence of coronary artery

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disease among women. The prevalence of coronary artery disease among people with atypical chest pain was similar to previous studies. Considering the high prevalence of coronary artery disease in patients with positive exercise test and considering its low cost and accessibility, exercise test is approved as a primary method of diagnosis in patients with chest pain.

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