



# Illness Perceptions in Patients with Premature Coronary Artery Disease: A Sex-Based Analysis 8 Years After the Diagnosis

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## Abstract

To assess illness perceptions in patients with premature atherosclerotic coronary artery disease (CAD), 717 adults with premature CAD (diagnosis of CAD in men age < 45 years and women age < 55 years) completed sociodemographic indices, the Beck's Depression Inventory-II, Beck Anxiety Inventory and the Brief Illness Perceptions 8 years after the diagnosis. Mean age was  $49.59 \pm 3.57$  years for men and  $57.72 \pm 4.90$  years for women at the time of study. Both sexes were treated through coronary artery bypass graft surgery, percutaneous coronary intervention, or medical treatment. Depressive and anxiety symptoms were significantly more prevalent among women. Generally, the patients believed that their disease was chronic and well controlled and that it had no considerable negative impact on their routine life. Overall, patients had a low concern about their illness. Women had a more negative perception of their disease than did men which may indicate their need for higher psychological support.

**Keywords** Illness perception · Coronary artery disease · Premature · Atherosclerosis

## Background

Coronary artery disease (CAD) is the leading cause of morbidity and mortality worldwide (GBD 2013 Mortality and Causes of Death Collaborators, 2015). Early presentation of CAD may impose a much more significant burden on families and societies (Cole, Miller, Sperling, & Weintraub,

2003; Shah, Kelly, Cox, Wong, & Soon, 2016). Despite advanced treatment options for CAD in recent years, the prevention of undesirable outcomes particularly in younger patients is strongly allied to the patient's contribution to controlling risk factors and managing the illness (Konishi et al., 2014; Mukherjee et al., 2003). Consistent with the previous findings, cognitive representations of coronary heart disease

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contribute to both global health status and quality of life ratings by patients and also mediate the associations between coronary heart disease severity and well-being (Aalto et al., 2006). Therefore, patients' beliefs about their condition may have a prominent influence on their psychological well-being and, thus, on their positive contribution to any secondary preventive strategies (Kucukarslan, 2012).

The pattern of patients' perceptions of their illness can directly affect their emotional response to the illness and their illness-specific behaviour such as adherence to preventive and treatment strategies (Petrie & Weinman, 2006). Evidence in recent years has shown that patients' negative views of their disease are associated with poorer outcomes independent of the severity of their medical condition (Petrie & Weinman, 2006; Botha-Scheepers et al., 2006; Scharloo et al., 2000). Accordingly, applying interventions to change illness perceptions (IPs) can reduce disability and improve functional capacity (Petrie & Weinman, 2006; Petrie, Cameron, Ellis, Buick, & Weinman, 2002). This assumes greater significance when patients are at younger age and have to deal with their disease for a longer time. Therefore, determining IPs among patients with premature CAD may help improve their outcome and increase the length of their working life.

In addition, it is well documented that women with early onset CAD have higher rates of psychological distress (Nabi et al., 2010; Shanmugasagaram, Russell, Kovacs, Stewart, & Grace, 2012) and poorer outcomes after myocardial infarction than do their male counterparts (Mallik et al., 2006; Shah et al., 2014). Also difference between men and women are factors associated with depressive symptoms and anxiety (Abbasi et al., 2016a, b). However, differences in IPs between men and women with established premature CAD are yet to be fully explored.

In this study, we sought to examine the status of IPs among patients with premature CAD and to evaluate their point of views about the disease years after the diagnosis of CAD with a view to determining differences in IPs between men and women. Such differences may help to develop sex-specific treatment strategies.

## Methods

### Participants

This cross-sectional study recruited patients with a history of premature CAD (defined as diagnosis of coronary artery disease at the age of <45 years for men and <55 years for women). The participants in this study were recruited from a cohort of patients with premature CAD included in the Tehran Heart Center Premature Atherosclerosis Cohort (THC-PAC study) (Abbasi et al., 2015). A total of 870 patients

in this cohort have been visited annually in the outpatient clinic by a cardiologist since 2012. From the 870 patients, 717 accepted to complete the Beck's Depression inventory-II (BDI-II), Beck Anxiety Inventory (BAI) and the Brief Illness Perception Questionnaire (B-IPQ) during their inpatient visits between November 2016 and April 2017. The protocol of this study was approved by the Review Board of Tehran Heart Center, and all the patients provided informed consent.

### Data Collection

Data on cardiovascular risk factors and clinical status were collected by a cardiologist for all the patients. Sociodemographic indices such as sex, marital status, age, and level of education were recorded. Patients received three types of treatment at the time of CAD diagnosis; coronary artery bypass graft surgery (CABG), percutaneous coronary intervention (PCI), and medical treatment (treatment by drugs). All the patients were asked to complete BDI-II (Beck, Steer, Ball, & Ranieri, 1996), and BAI (Beck, Epstein, Brown, & Steer, 1988), and the B-IPQ (Broadbent, Petrie, Main, & Weinman, 2006) in relation to their CAD. As questionnaires were only collected at the time of follow-up, this is a cross-sectional not longitudinal study.

The BDI-II is a 21 item self-report inventory used to assess the severity of depressive symptoms. Each item is scored from 0 to 3 and the total score can range from 0 to 63 with higher scores reflecting greater levels of depressive symptoms. According to the previous published standards, we considered following cut off values for describing severity of depressive symptoms: scores 0–13, no symptom; 14–19, mild; 20–28, moderate; and 29–63, severe symptoms (Beck, et al. 1961; Wang & Gorenstein, 2013).

The BAI is a 21-item measure of anxiety symptoms. Each item is rated from 0 to 3, and the total score can range between 0 and 63 with higher scores reflecting greater levels of anxiety symptoms. Based on published standards, levels of severity are: scores 0–7, no/minimal anxiety; 8–15, mild anxiety; 16–25, moderate anxiety and 26–63, severe anxiety (Kaitz, Mankuta, Rokem, & Faraone, 2014). These questionnaires have been validated in the Persian language (Ghassemzadeh, Mojtabei, Karamghadiri, & Ebrahimkhani, 2005; Kaviani & Mousavi, 2008; Bazzazian & Besharat, 2010).

B-IPQ which has good construct validity, concurrent validity and internal consistency, although poor test-retest reliability for some items (i.e. concern and coherence), was used to assess IPs. (Bazzazian & Besharat, 2010). This questionnaire has 9 items: (1) consequences, (2) timeline, (3) personal control, (4) treatment control, (5) Identity, (6) illness concern, (7) illness comprehension, (8) emotional response and (9) causal representation. There is only 1 item to measure each concept which is rated on a 0–10 scale. First 5 items measure cognitive perceptions, items 6 and 8 measure

emotional perceptions and item 7 measures comprehension. In the original B-IPQ, questions 3, 4, and 7 are reversed, showing that a higher score is considered beneficial. In the Persian version of the questionnaire, in addition to questions 3, 4, and 7, question 6 has also been validated in the reverse format. Therefore, in the original questionnaire for the question number 6, higher scores represent more concern (0 = not at all concerned, ..., and 10 = extremely concerned), while in the Persian version the score is reversed (0 = extremely concerned, ... and 10 = not at all concerned). To make the values for question 6 obtained from our study, patients comparable to the original questionnaire; we reversed patients' answer during analysis by subtracting their score from 10.

The patients were instructed to consider only their CAD when answering the B-IPQ. Causal representations were measured with 1 open-ended item (item 9) that asks patients to identify the 3 most important causes for their cardiac disease.

### Statistical Analysis

The normal distribution of the sample data were evaluated using descriptive central tendency and dispersion measures as well as histogram charts. Scores for the items of B-IPQ were not normally distributed. The normally distributed variables are described with means and SDs, and the skewed or non-normally distributed variables are expressed as medians with 25th and 75th percentiles (interquartile range boundaries). The  $\chi^2$  test was used in order to discover possible differences in the categorical variables between the men and women. An independent *t* test was used to compare mean age between men and women, and the Mann–Whitney *U* test was employed to verify possible differences between the men and women and also between married and single patients in terms of IPs. The Spearman correlation coefficient was applied to examine the relationships between IPs and age, level of education, and marital status. A *p* value < .05 was considered significant.

### Results

A total of 717 patients were included in the final analysis: 374 (52.2%) women and 343 (47.8%) men. The mean age of the overall sample at the time of establishing premature CAD was  $45.35 \pm 5.79$  years. The demographic, social and clinical characteristics of both sexes are presented in Table 1. According to Table 1, the men were younger, more frequently married and better educated. The frequency of women who underwent CABG was similar to that of men. This was also true for the other two types of treatment; PCI and medical treatment.

**Table 1** Demographic, social and clinical characteristics of the patients at the time of study

	Total ( <i>N</i> =717)	Men ( <i>n</i> =343)	Women ( <i>n</i> =374)	<i>p</i>
Age at diagnosis	45.35 ± 5.79	41.09 ± 3.31	49.26 ± 4.73	< .001
Age at follow-up	53.83 ± 5.93	49.59 ± 3.57	57.72 ± 4.90	< .001
Married	649 (90.5)	324 (94.5)	325 (86.9)	< .001
Educational level				
Up to primary school	170 (23.7)	44 (12.8)	126 (33.7)	< .001
Up to high school	457 (63.7)	235 (68.5)	222 (59.4)	.011
Higher education	90 (12.6)	64 (18.7)	261 (7)	< .001
BMI category				
Normal	121 (16.9)	58 (16.9)	63 (16.8)	.982
Overweight	324 (45.2)	166 (48.4)	158 (42.2)	.098
Obese	272 (37.9)	119 (34.7)	153 (40.9)	.087
Treatment type				
Medical treatment	279 (38.9)	136 (39.7)	143 (38.2)	.898
PCI	277 (38.6)	134 (39.1)	143 (38.2)	.819
CABG	161 (22.5)	73 (21.3)	88 (23.5)	.471
Depression symptom				
No/mild	552 (77.0)	293 (85.4)	259 (69.3)	< .001
Moderate	93 (13.0)	28 (8.2)	65 (17.4)	< .001
Severe	72 (10.0)	22 (6.4)	50 (13.4)	.002
Anxiety symptom				
No/mild	537 (74.9)	291 (84.8)	246 (65.8)	< .001
Moderate	112 (15.6)	35 (10.2)	77 (20.6)	< .001
Severe	68 (9.5)	17 (5.0)	51 (13.6)	< .001

Continuous variables are presented as mean ± standard deviation and were compared using an independent *t* test. Categorical variables are presented as number (%) and were compared using Chi square test

*BMI* body mass index, *PCI* percutaneous coronary intervention, *CABG* coronary artery bypass graft

The follow-up duration after the diagnosis of CAD was  $101.69 \pm 21.70$  months. Mean age of the overall sample was  $53.83 \pm 5.93$  years at the time of follow-up and men were significantly younger than women (Table 1). Based on the findings from the completed questionnaires, concomitant clinically important psychological symptoms in terms of more-than-mild depression and anxiety symptoms were found in 23 and 25.1% of the total participants, respectively. Depressive symptoms were more commonly reported by women (17.4% moderate and 13.4% severe) than among the men (8.2% moderate and 6.4% severe) (*p* < .001). Moderate and severe forms of anxiety symptoms were also significantly higher in the women (20.6% moderate and 13.6% severe) than in men (10.2% moderate and 5% severe anxiety) (*p* < .001).

Our descriptive statistics relevant to the 8 items in the B-IPQ (Table 2) showed that, generally, patients with

**Table 2** Comparisons between the men and women regarding the distribution of the scores given for the 8 items of the Brief Illness Perception Questionnaire (B-IPQ) by the patients with premature coronary artery disease

B-IPQ items	Total ( <i>N</i> =717)	Men ( <i>n</i> =343)	Women ( <i>n</i> =374)	<i>p</i>
1. How much does your illness affect your life?	3 (0–6)	3 (0, 5)	5 (0, 7)	<.001
2. How long do you think your illness will continue?	10 (5–10)	10 (5, 10)	10 (5, 10)	.14
3. How much control do you feel you have over your illness?	8 (5–10)	8 (5, 10)	8 (5, 10)	.85
4. How much do you think your treatment can help your illness?	9 (7–10)	9 (7, 10)	9 (6, 10)	.49
5. How much do you experience symptoms from your illness?	5 (2–7)	4 (1, 6)	5 (2, 7)	.014
6. How concerned are you about your illness?	4 (0–7)	3.7 (0, 6)	4(0, 7)	.20
7. How well do you feel you understand your illness?	8 (5–10)	8 (6, 10)	8 (5, 10)	.50
8. How much does your illness affect you emotionally? For example, does it make you angry, scared, upset or depressed?	4 (0–7)	3 (0, 7)	5 (0, 8)	.002

Scores are presented as median (25, 75% percentile) and were compared using Mann–Whitney *U* test

early onset CAD believed that their cardiovascular condition was a chronic disease (median score = 10) and could be well controlled either by themselves (median score = 8) or by treatment (median score = 9). The respondents moderately attributed the frequent experience of CAD-related symptoms to their illness (median score = 5) and believed that the disease exerted no considerable negative impact on their routine lives (median score = 3). Furthermore, they felt that their disease had a moderately negative impact on their emotional status (median score = 4) and generally reported a good understanding of their illness (median score = 8). Overall, the patients were not highly concerned about their disease (median score = 4).

Comparisons between the men and women with regard to the distribution of the 8 items of the B-IPQ are depicted in Table 2. Compared to the men, the women believed that the disease exerted a higher negative impact on their lives (median score = 5 in the women vs. 3 in the men;  $p < .001$ ). The women also reported a higher proportion of CAD-related symptoms ( $p = .014$ ) and believed in higher impact of the disease on their emotional responses ( $p = .002$ ) than did the men (Table 2). To investigate the possible effects of age, educational level, and marital status on these differences, we tested linear correlations between each B-IPQ item and age and educational level and obtained very weak correlations. (The Spearman correlations were between 0.008 and 0.117). There was also no significant difference in the median score for each B-IPQ item between the married and single patients.

Table 3 presents the patients' answers to the open question (item 9), which investigates their perception of the possible causes of CAD. For this analysis, we examined all of the answers provided by patients. From 717, 21 participants did not answer this question; the remaining 696 patients reported a total of 1752 factors that they believed were the causes of their illness. We categorized the answers into 7 groups: (1) stress, (2) emotional causes (i.e. anger, sadness,

**Table 3** Frequencies of different factors given by the patients with premature CAD that show their belief about the causes for illness

	Total ( <i>N</i> =717)	Men ( <i>n</i> =343)	Women ( <i>n</i> =374)	<i>p</i>
Emotional	472 (26.6)	157 (18.5)	310 (34.56)	<.001
Bad life style	367 (20.7)	260 (29.7)	107 (11.9)	<.001
Stress	343 (19.3)	169 (19.3)	174 (19.4)	.974
CAD risk factors	175 (9.9)	68 (7.8)	107 (11.9)	.003
Genetic	174 (9.8)	99 (11.3)	75 (8.4)	.036
Others	221 (12.5)	104 (11.9)	117 (13)	.376
No answer	21 (1.2)	13 (1.5)	8 (0.9)	.247

Maximum of three factors was given for open question 9 of Brief Illness Perceptions questionnaire by each participant

Data are presented as number (%). Comparisons were performed using Chi square test

CAD coronary artery disease

and relationships and extreme reaction to family issues), (3) genetic causes (history of CAD in first-degree relatives), (4) CAD risk factors (hypertension, hyperlipidemia, and diabetes mellitus), (5) poor lifestyle (i.e. obesity, poor diet, and smoking), (6) other causes and (7) No answer to be consistent with the table. Classification of causal IPs was performed by two authors simultaneously and final decision was achieved by the agreement of the two. The most frequently cited cause of CAD by women was emotional causes (34.5%), followed by stress (19.4%) and CAD risk factors (11.9%). In contrast, the men indicated poor life style (29.7%), stress (19.3%) and emotional causes (18.5%) as the most frequent causes. Comparison between men and women (Table 3) showed that women cited emotional causes significantly more than did the men (34.5 vs. 18.5%, respectively;  $p < .001$ ). Women also indicated CAD risk factors as causal more than men (11.9 vs. 7.8%, respectively,  $p = .003$ ). In contrast to the women, the men more frequently cited poor lifestyle (29.7 vs. 11.9%, respectively;  $p < .001$ ) and

genetic background (11.3 vs. 8.4%, respectively;  $p = .036$ ). As casual factor, both sexes cited stress with equal percentages (Table 3).

In further analysis, we investigated differences in IPs between the men and women with respect to their symptoms of psychological distress. We divided the patients into 4 subgroups according to the presence or absence of depression and anxiety symptoms as follows: no depression and anxiety, only anxiety, only depression and both depression and anxiety symptoms. The results of the subgroup analysis are presented in Table 4. The men and women did not have any differences in IPs in the first 3 subgroups. Among the patients with both depression and anxiety symptoms, the women reported a significantly lower score in relation to treatment control ( $p = .025$ ) showing that the women in this group were also significantly more concerned about their illness ( $p = .002$ ) and reported a lower level of understanding about their illness than men ( $p = .018$ ).

## Discussion

According to our results, the reported IPs profiles by the overall study population indicated that the participants experienced their CAD as chronic and potentially controllable with no high negative impact on their life. Moreover, they presented a good understanding of the condition and were not highly concerned about their disease. In addition, we observed that in premature CAD patients, there were differences in IPs between the men and women. Overall, the women had a more negative perception of their cardiac

disease than did the men, which seems to be irrespective of age, marital status, and educational level. In women, anxiety symptoms seemed to have association with less illness understanding, less belief in the ability of treatment to control CAD, and more concerns about their illness.

The role of IPs in the psychological well-being and outcome of patients with cardiovascular diseases has been a matter of investigation in many studies (Donkin et al., 2006; Jonsbu, Martinsen, Morken, Moum, & Dammen, 2012; Morgan, Villiers-Tuthill, Barker, & McGee, 2014; Petriček et al., 2009; Petrie et al., 2002; Petrie, Weinman, Sharpe, & Buckley, 1996). Nonetheless, only 1 study included patients with premature CAD (Shah et al., 2014). When ischemic heart disease occurs early in life, the patient's perspective on the illness may hold an important role in the outcome, treatment and control of the disease (Kucukarslan, 2012). In the present study, we observed that neither men nor women were very concerned about their disease and we think this may contribute to non-adherence to treatment. Although overall the patients did not mention prominent consequences and emotional influence of CAD, there was a concern that the perceived consequences and the extent of negative emotional response generated by CAD for the women were considerable. In addition, women in our study experienced significantly higher symptoms of CAD than did men. To explain this difference, we hypothesized that higher age, lower educational level and lower frequency of marriage among the women as is attested to by Table 1 might have contributed to this difference. Our analysis did not show any significant correlation between age, educational level, marital status and each of the IPs, however. This may be because of sex

**Table 4** Comparisons of illness perception between the men and women with respect to the presence or absence of depression and anxiety

	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>	Q <sub>4</sub>	Q <sub>5</sub>	Q <sub>6</sub>	Q <sub>7</sub>	Q <sub>8</sub>
No/mild depression or anxiety symptoms								
Men, $n = 263$	2 (0, 4)	10 (4, 10)	8 (5, 10)	10 (7, 10)	3 (1, 5)	4 (0, 6)	8 (6, 10)	3 (0, 5)
Women, $n = 209$	2 (0, 5)	10 (5, 10)	9 (5, 10)	10 (7, 10)	4 (0, 6)	4 (0, 7)	9 (6, 10)	3 (0, 7)
$p$	.18	.22	.34	.39	.34	.89	.43	.51
Anxiety symptoms > mild								
Men, $n = 30$	5 (3, 6)	10 (9, 10)	6 (5, 8)	8 (6, 10)	7 (4, 8)	3 (1, 5)	7 (5, 9)	4 (3, 7)
Women, $n = 50$	5 (2, 9)	10 (5, 10)	7 (5, 8)	9 (5, 10)	6 (4, 9)	3 (1, 6)	8 (5, 10)	6 (1, 9)
$p$	.57	.29	.39	.63	.94	.73	.38	.32
Depression symptoms > mild								
Men, $n = 28$	5 (3, 8)	9 (5, 10)	6 (4, 8)	8 (6, 10)	4 (3, 6)	4 (0, 7)	8 (5, 10)	6 (4, 9)
Women, $n = 37$	5 (4, 7)	10 (8, 10)	8 (5, 10)	9 (8, 10)	5 (4, 7)	4 (0, 7)	8 (6, 10)	6 (5, 9)
$p$	.94	.062	.067	.44	.065	.88	.52	.66
Both anxiety and depression symptoms > mild								
Men, $n = 22$	7 (5, 10)	10 (9, 10)	7 (5, 8)	10 (7, 10)	7 (5, 8)	3 (0, 5)	9 (7, 10)	8 (5, 10)
Women, $n = 78$	7 (5, 9)	10 (6, 10)	6 (4, 8)	7 (5, 10)	6 (3, 8)	5 (2, 10)	7 (4, 9)	7 (5, 10)
$p$	.28	.32	.50	.025	.16	.002	.018	.80

Scores are presented as median (25, 75% percentile) and were compared using Mann–Whitney  $U$  test  
Q question; refers to the 8 questions listed in Table 2

differences in the descriptions of angina symptoms and that women and the fact that women are more likely to report more symptoms than are men (Philpott, Boynton, Feder, & Hemingway, 2001).

In the context of the relationship between depression or anxiety and the prognosis of cardiovascular disease, a few studies have focused on premature CAD patients. In a study by Brummett et al., (2004), young women reported on average higher levels of perceived stress than did men over a 2-year period following the diagnosis of CAD. Another study in its follow-up of patients that underwent CABG showed that age  $\leq 65$  years was correlated with fear and anxiety (Koivula, Hautamaki-Lamminen, & Astedt-Kurki, 2010). The most recent study (Shah et al., 2014) revealed that in patients with CAD, women  $\leq 55$  years had more depressive symptoms than men in a similar age category and depressed women  $\leq 55$  years had substantially higher CAD comorbidity and worse prognosis. In the present study, we observed that among patients with early onset CAD, women had not only more depressive and anxiety symptoms but also a more negative perception of their disease than did men 8 years after the diagnosis of the cardiac illness. Morgan et al., (2014) observed that IPs had a significant role in elucidating depressive symptoms and anxiety in patients with heart failure and pointed out that IPs should be addressed as a primary modifiable component in the development of depressive symptoms in heart failure. According to the findings of this study, the presence of both depression and anxiety symptoms in patients with premature CAD might be correlated with lower levels of understanding and more concern about the disease as well as less belief in the ability of treatment to control the disease 8 years after the diagnosis. These results indicate the need for new approaches to the management and prevention of anxiety and depression in patients with premature CAD.

In our study, women were more likely to attribute their CAD to emotional status during life, which was accompanied by greater depressive and anxiety symptoms. In contrast, the men focused on poor lifestyle and genetic sources of the disease. These results are in line with previous findings that women tend to be more emotionally expressive than men (Deng, Chang, Yang, Huo, & Zhou, 2016) and may have biologically greater sensitivity and vulnerability to adverse/stressful events (Bianchin & Angrilli, 2012).

## Limitations

Although the present study has important strengths such as a relatively large sample size, findings should be interpreted in light of certain limitations. Firstly, this is a single centre study, and future multi centre studies are needed to confirm the results. Secondly, this study is cross-sectional with patients enrolled years after the diagnosis. Therefore,

the effect of IPs on the outcome of patients and causality between IPs and symptoms of psychological distress cannot be determined. Thirdly, the B-IPQ descriptive statistics were interpreted without reference or comparison to the scores found in other comparable populations. Such comparison could increase the strength of the results obtained from premature CAD patients.

## Conclusions

This study set out to investigate IPs profiles in patients with premature CAD. Overall, we observed a relatively high level of understanding of the condition and low concern reported by the patients. Patients believed that their disease was chronic and potentially controllable with no considerable negative impact on their life. We also found that women had a more negative perception of their cardiac disease than did men. In light of the results of the present study, it seems that anxiety symptoms may explain some differences in IPs between men and women symptoms is correlated with differences between men and women. Further research is necessary to investigate the nature of sex differences in IPs among those patients who experience CAD early during their life.

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## Compliance with Ethical Standards

**Conflict of interest** Masoumeh Lotfi-Tokaldany, Abbasali Karimi, Nazila Shahmansouri, Saeed Sadeghian, Seyed Hesameddin Abbasi, Arash Jalali, Farah Ayatollahzade Isfahani and Soheil Saadat declare that they have no conflict of interest.

**Human and Animal Rights** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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