Psychological characteristics in patients with non-cardiac chest pain

Psihološke karakteristike bolesnika sa bolom u grudima bez srčanog uzroka

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Abstract

Background/Aim. Chest pain of no heart origin resembles angina and when none medical reason is found, the patients are referred to psychiatrist for further assessment. The aim of this reserch was to determine psychological characteristics of the patients with non-coronary chest pain (NCCP), difference compared to the coronary patients and the predictive value of those parameters for NCCP. **Methods.** Fourty consecutively recruited patients without a diagnose of heart disease (NCCP group) were examined and compared to 45 coronary patients (C group). For psychiatric diagnose, the Mini-International Neuropsychiatric Interview (MINI) was used. Psychological symptoms were assessed by the Symptom Checklist-90-Revised (SCL-90R), exposure to life events was scored by the Holms &Rahe Scale and levels of anxiety and depressiveness by the Back Anxiety Inventory and Back Depression Inventory. The statistical analysis was done by using the software package SPPS17. The Student's-t test and χ^2-test were used for estimating more difference between groups while ANOVA determined parameters associated with NCCP. **Results.** The NCCP patients were younger (33.40 ± 5.43 vs. 48.37 ± 6.43, $p < 0.001$), more anxious (20.47 ± 11.93 vs. 9.63 ± 3.86, $p < 0.001$), had more exposure to life events (102.03 ± 52.22 vs. 46.5 ± 55.08, $p < 0.001$) and were more distressed (41.37 ± 7.70 vs. 29.37 ± 5.67, $p < 0.001$), while coronary patients were more depressed and hostile. The regression analysis indicated that elevation in anxiety score for 1 point, means 25% of a higher chance [odds ratio (OR) = 1.25; 95% confidence interval (CI): 1.10–1.41] and elevation in the Life events score, means 2% of a higher chance that subject belonged to the NCCP group (OR = 1.02; 95% CI: 1.01–1.03). The younger subjects were more likely to have non-cardiac chest pain (OR = 0.58, 95% CI: 0.42–0.80). **Conclusion.** The results suggested that the patients with NCCP had none associated psychiatric disorder, but showed higher distress level, more exposure to negative life events and moderate anxiety level. Psychological help could be of a benefit to prevent possible psychiatric issues in young people with non-cardiac chest pain.

Key words:
coronary disease; chest pain; diagnosis, differential; risk factors; psychological tests; stress, psychological; anxiety; depression.

Apstrakt

Uvod/Cilj. Bol u grudima koji nije srčanog porekla često liči na anginozni i kada se ne pronađu medicinski uzroci, bolesnici se upućuju psihijatru radi dalje procene. Cilj istraživanja bilo je utvrđivanje psiholoških karakteristike bolesnika sa bolom u grudima bez koronarnog uzroka, razlika u poređenju sa koronarnim bolesnicima i prediktivnih vrednosti parametara za bol bez koronarnog uzroka. **Metode.** Konsekutivno je bilo regrutovano 40 bolesnika bez dijagnoze srčane bolesti (BDSB grupa) sa simptomima bola u grudima, koji su upoređeni sa 45 koronarnih bolesnika (K grupa). Za postavljanje dijagnoze psihijatrijske bolesti korišćen je Mini-internacionalni neuropsihijatrijski intervju (MINI), za procenu psiholoških simptoma Upitnik liste simptoma-90-revidirani (SCL-90R upitnik), za procenu izloženost životnim događajima Holmas Rahe skala, a za procenu nivoa anksioznosti i depresivnosti Bek–ov upitnika za anksioznost i Bek-ov upitnik za depresivnost . Statistička analiza rađena je pomoću SPPS 17, a korišćeni su Student-ov t-test i χ^2 test za utvrđivanje razlike između parametara u grupama. ANOVA je upotrebljena radi određivanja parametara koji su povezani sa bolom u grudima bez koronarnog uzroka. **Rezultati.** Bolesnici u BDSB grupi bili su mlađi (33,40 ± 5,43

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vs 48,37 ± 6,43, *p* < 0,001), anksiozniji (20,47 ± 11,93 *vs* 9,63 ± 3,86, *p* < 0,001), više izloženi životnim događajima (102,03 ± 52,22 *vs* 46,5 ± 55,08, *p* < 0,001) i imali su viši nivo distresa (41,37 ± 7,70 *vs* 29,37 ± 5,67, *p* < 0,001), dok su koronarni bolesnici bili više depresivni i hostilni. Regresiona analiza je pokazala da porast skora anksioznosti za 1 poen, znači 25% veću šansu da subjekt pripada BDSB grupi [*odds ratio* (OR) = 1,25; 95% interval poverenja (IP): 1,10–1,41] i porast skora životnih događaja znači 2% veću šansu da bolesnik pripada BDSB grupi (OR = 1,02; 95% IP: 1,01–1,03). Mlađi ispitanici imali su veću šansu da pripadaju BDSB grupi (OR = 0,58, 95% CI: 0,42–0,80). **Zaključak.** Bolesnici BDSB grupe nisu imali udruženi psihijatrijski poremećaj, ali su imali viši nivo distresa, izloženost životnim događajima i umereni nivo anksioznosti. Psihološka pomoć mladim ljudima sa bolom u grudima bez srčanog uzroka, mogla bi biti korisna u cilju prevencije mogućih psihijatrijskih poremećaja.

Ključne reči:
koronarna bolest; grudi, bol; dijagnoza, diferencijalna; faktori rizika; psihološki testovi; stres, psihički; anksioznost; depresija.

Introduction

Pain is a main medical symptom motivating people to have a medical examination. If uncomfortable sensations are in the chest, a cardiologist is always involved. Physical, biochemical, para-clinical and invasive diagnostic procedures are used to diagnose cardiovascular disease (CVD), or other medical cause for chest pain [1]. If the results are negative and sensations are not of somatic origin, it is possible that psychological factors play a role in such clinical manifestation [2]. Carefully taken medical history can sometimes discover emotional distress, precipitating oppressive squeezing or pressure [3]. In these cases, the patients are referred to a psychiatrist, for further assessment and treatment. Some researches in this area consider every chest pain a sign of subclinical atherosclerosis (syndrome X), even when the invasive techniques (percutaneuos angiography) do not confirm atherosclerosis of heart arteries [4, 5]. However, the patients prone to anxiety reactions to stressful situations, have somatic sensations due to surges in catecholamines. Located in the chest, the sensations reinforce anxiety and fear of death, leading to numerous claims for cardiologic checks, despite negative results for CVD. On the other hand, it is well-known, that general anxiety disorder is a risk factor for experiencing acute cardiac events in the CVD patients [6].

In consultative psychiatric practice, we have examined the patients without a CVD diagnose , but with complains of atypical, pain-like sensation in their chest. In many cases, we could not set psychiatric diagnose since their symptoms did not match any disorder according to the International Classification of Diseases-10 (ICD-10) [7].

The aim of this research was to determine the psychological characteristics of the patients with non-coronary chest pain (NCCP), the differences comparing the coronary patients and the predictive value of NCCP parameters.

Methods

Subjects

The cross-section study was performed in the Clinic for Mental Health Protection in Niš with 40 consecutively recruited patients with NCCP. Inclusive criteria were absence of diagnosed organic cause of chest pain and psychotic disorder. The subjects were referred to a psychiatrist for the further examination, after heart disease and other medical reasons for chest pain were ruled out by the complete physical and at least twice repeated the cardiologic paraclinical examination: treadmill test, echocardiography, electrocardiography, biochemical analyses and markers for myocardial ischemia in the Clinic of Cardiology, Clinical Centre in Niš. Coronary angiography was not performed due to the previous negative results, but neurological, gastroenterological and surgical check-ups were also done prior to the psychiatric evaluation. The pain characteristics were obtained from the medical data. The diagnostic algorithm included the description of pain, intensity (scale from 1–10), location, duration of sensation, circumstances of pain occurrences and what stops the pain. All subjects diagnosed with organic pain (esophageal reflux, ulcers, diaphragm hernia, degenerative process in vertebrae and costal-vertebral joints, rheumatism, pulmological and pleural conditions) were excluded from further psychiatric evaluation. The control group (C group) consisted of 45 patients with coronary disease confirmed by suffered myocardial infarction and coronary angiography in the previous three years. The exclusion criteria were presence of other medical condition associated with chest pain. From the pool of 105 previously recruited subjects, only 40 subjects from the NCCP and 45 subjects from the C group fulfilled inclusive criteria and completed the questionnaires.

The psychiatric evaluation was conducted in the outpatient setting during one-year period.

All patients gave their written consent to participate after receiving information about the study. The local Ethics Committee Permission and institutional approval were obtained.

Instruments

The demographic and data of risk health behavior were collected from the medical records. Risky alcohol consumption was determined as more than 7 standard drinks per week (14 grams of ethyl alcohol). The smoker status meant smoking cigarettes now or ever. The presence of physical activity meant a physical effort at least three times a week, lasting for 1 hour and the absence means sedentary lifestyle [8].

For the psychiatric diagnose, we used the Mini International Neuropsychiatric Interview [9], (MINI). Two psychiatrists performed evaluation for each patient and compared results with criteria at ICD-10 manual.

The presence of psychological symptoms in the previous week as well as the level of actual distress were assessed by the Symptom Checklist-90-Revised (SCL-90R), a questionnaire containing 90 items, grouped in 9 subscales describing 9 dimensions of psychopathology. Higher level of each, indicated more prominent characteristics [10, 11]. The indicators of actual disstress level were calculated from the scales : Global Severity Index (GSI), Positive Symptom Total (PST) and Positive Symptom Distress Index (PSDI). Every dimension score > 63, meant that it was of a clinical significance.

The Back Anxiety Inventory (BAI) was used to estimate intensity of anxiety [12]. It was a multiple-choice, self-reported questionnaire of 21 items, scored on Likert scale from 0 (not at all) to 3 (severely expressed). Cut-off score for clinically expressed anxiety was 8 points. The instrument was very reliable, Cronbash's $\alpha = 0.92$, [95% confidence interval (CI): 0.89–0.95].

The Back Depression Inventory (BDI) measured depressiveness. It consisted of 21 items, each scored on the four-point Likert scale from 0–3 with the total score ranging 0–63. Cut-off score for clinical significant depression was 10. The higher score indicated more severe depressiveness [13]. The Cronbach`s alfa coefficient for the sample was 0.68 (95% CI: 0.53–0.80), meaning a good reliability of the instrument for the sample.

The Holms-Rahe (H-R) scale was self – rating inventory measuring experience of life events in the previous year. The score ≥ 100 shows the predisposition for an anxious reaction; more than 150 points mean 30% of chance to somatic breakdown due to distress [14].

Statistical analysis

The data collected through a direct contact with the patients, or from a patient's history (total n = 85) were presented as the frequency distribution tables expressed as percentages and analyzed using the SPSS version 17.0 (IBM Corp, 2007). The existence of any statistical difference between the groups was defined using the Student's *t*-test and χ^2-test for parametric and non-parametric parameters, respectively. The ANOVA regression analysis was performed to determine the parameters associated with non-cardiac chest pain, all the statistically significant parameters found by the univariate analysis were introduced into the multivariate regression analysis in order to identify the independent factors associated with non-cardiac chest pain. The probability values (*p*) that were less or equal to 0.05 were considered statistically significant. In order to estimate the reliability of the psychometric tests (BAI and BDI), the Cronbach's alpha was calculated.

Results

Fourty NCCP patients were compared to 45 coronary patients (C group) for the demographic, biological and risk health behavior characteristics.

The groups were similar by all demographic parameters except the age, frequency of hypercholesterolemia, diabetes mellitus and hypertension. The subjects with NCCP were significantly younger, had less biological risk factors compared to the coronary patients (Table 1). There were no differences in the lifestyle characteristics, between then groups.

Psychological characteristics and distress levels

The psychological symptom pattern assessed by the SCL-90R indicated depression and hostility among the coronary patients as significantly higher. The distress measures: GSI and PSDI were significantly higher in the NCCP group, indicating emotional disturbances experienced by a patient with NCCP (Table 2).

Table 1
Difference in the demographic characteristics, health risk behavior and biological factors

Variables	Groups		*p*
	NCCP (n = 40) n (%)	C (n = 45) n (%)	
Females	24 (60.00)	25 (55.55)	ns
Married	36 (90.00)	33(73.33)	ns
Education 8 years	6 (15.00)	9 (20.00)	ns
Education 12 years	30 (75.00)	25 (55.55)	ns
Education > 12 years	3 (7.50)	8 (17.77)	ns
Employment	21 (52.50)	29 (64.44)	ns
Age (years), mean ± SD	33.40 ± 5.43	48.37 ± 6.43	< 0.001
Risky alcohol consumption	3 (7.50)	8 (17.77)	ns
Smoking	13 (32.50)	18 (40.00)	ns
Sedentary lifestyle	21 (52.50)	18 (40.00)	ns
Hypercholesterolemia	8 (20.0)	34 (75.55)	< 0.001
Diabetes mellitus	2 (5.00)	12 (26.66)	< 0.05
Hypertension	13 (32.50)	28 (62.22)	< 0.05

**NCCP – non-coronary chest pain patients; C – coronary patients;
SD – standard deviation; ns – non significant.**

Table 2

Difference in psychological dimensions between the groups

SCL-90R dimensions	Groups		p
	NCCP (n = 40) mean ± SD	C (n = 45) mean ± SD	
Somatization	60.63 ± 9.33	59.93 ± 4.58	ns
Obsessive-Compulsive	49.03 ± 11.95	50.27 ± 6.46	ns
Interpersonal Sensitivity	46.27 ± 10.77	49.63 ± 6.33	ns
Depression	48.33 ± 9.85	58.60 ± 4.70	< 0.001
Anxiety	58.07 ± 11.69	61.77 ± 5.60	ns
Hostility	50.63 ± 9.47	57.40 ± 5.03	< 0.01
Phobic anxiety	54.37 ± 9.15	54.43 ± 7.49	ns
Paranoid ideation	46.77 ± 9.77	46.23 ± 6.48	ns
Psychoticism	44.63 ± 11.04	41.27 ± 6.19	ns
Global Severity Index	41.37 ± 7.70	29.37 ± 5.67	< 0.001
Positive Symptom Distress Index	21.03 ± 20.92	0.20 ± 0.61	< 0.001
Positive Symptom Total	43.47 ± 25.51	43.97 ± 13.34	ns

SCL-90R – the Symptom Checklist-90-Revised; NCCP – non-coronary chest pain patients; C – coronary patients; SD – standard deviation; ns – non-significant.

Levels of anxiety, depressiveness and life events exposure

The anxiety level was moderate in the NCCP group and significantly different from the anxiety in coronary patients, which was in the normal range. The average score of life events was also significantly higher in the patients with NCCP, while the level of depressiveness was without a significant difference and below the cut-off limits in both groups (Table 3).

Predictive values of psychological parameters for cardiac chest pain

The univariate logistic regression showed that a patient with the increased levels of depression, hostility and distress had significantly higher chance to have coronary chest pain (Table 4).

Table 3

Difference in anxiety, depressiveness and exposure to life events between the groups

Psychological variables	Groups		p
	NCCP (n = 40) mean ± SD	C (n = 45) mean ± SD	
Anxiety (BAI)	20.47 ± 11.93	9.63 ± 3.86	< 0.001
Depressiveness (BDI)	9.60 ± 5.01	7.73 ± 1.91	ns
Holms-Rahe scale	102.03 ± 52.22	46.5 ± 55.08	< 0.001

NCCP – non-coronary chest pain patients; C – coronary patients; BAI – Back Anxiety Inventory; BDI – Back Depression Inventory; SD – standard deviation; ns – non-significant.

Table 4

Association of psychological dimensions with cardiac chest pain

SCL-90R	OR	95% CI for OR		p
		lower	upper	
Somatization	1.01	0.94	1.08	ns
Obsessive-Compulsive	0.97	0.93	1.04	ns
Interpersonal Sensitivity	0.96	0.90	1.02	ns
Depression	0.82	0.73	0.91	< 0.01
Anxiety	0.95	0.90	1.01	ns
Hostility	0.88	0.80	0.95	< 0.01
Phobic anxiety	0.99	0.93	1.06	ns
Paranoid ideation	1.01	0.94	1.07	ns
Psychoticism	1.04	0.98	1.11	ns
Global Severity Index	0.76	0.66	0.87	< 0.001
Positive Symptom Distress Index	0.83	0.64	1.06	ns
Positive Symptom Total	0.99	0.97	1.02	ns

SCL-90R –Symptom Checklist-90-Revised; ns – non-significant; OR – odds ratio; CI – confidence interval.

Table 5
**Association of age, emotional reactions, biological risk factors and life events
score with non-cardiac chest pain**

Psychological and biological variables	OR	95% CI for OR		p
		lower	upper	
BAI Anxiety	1.25	1.10	1.41	< 0.01
BDI Depressiveness	1.17	0.97	1.39	ns
Holms-Rahe Scale	1.02	1.01	1.03	< 0.01
Age	0.58	0.42	080	< 0.01
Hypercholesterolemia	0.08	0.02	0.30	< 0.01
Diabetes mellitus	0.09	0.01	0.82	< 0.05
Hypertension	0.29	0.09	0.95	< 0.05

OR – odds ratio; CI – confidence interval; BAI – Back Anxiety Inventory;
BDI – Back Depression Inventory; ns – non-significant.

The prediction factors of non-coronary chest pain

The regression analysis indicated that an elevation in the anxiety score for 1 point, meant 25% higher chance that the subject belonged to the NCCP group [odds ratio (OR) = 1.25; 95% CI: 1.10–1.41]. An elevation in the life events score meant that there were 2% higher chance that the chest pain was not the coronary one (OR = 1.02; 95% IP: 1.01–1.03) (Table 5).

The results showed that the younger subjects were more likely to have NCCP (OR = 0.58, 95% CI: 0.42–0.80).

All factors that were statistically significant according to the univariate analysis were introduced into the multivariate analysis, but no parameter was found to be significant (data not presented). However, the patients' age and anxiety level were near the statistically significant value [$p = 0.0517$ (OR = 0.892) and for anxiety, it was found that $p = 0.0581$ (OR = 1.025), respectively]. A limited number of patients in the study were probably a reason for the absence of statistical significance, but these parameters could possibly be associated with NCCP.

Discussion

This study focused on the forty patients with angina-like sensations, free of CVD. Their uncomfortable sensations were varying in their location in the chest, duration, description and intensity. They were not associated with physical strain, food intake or change in body position. It occurred more than twice a week, sometimes every day and lasted for hours. The subjects described their pain like squeezing, burning, pressure, chest barrier, sharp needle sticks. The psychiatric anamnesis indicated that the negative life events and emotional distress preceded the sensations, but it also appeared during the night and at rest and everyday situations. The pain like a sensation usually diminished spontaneously, or with using anxiolitics. In relevant literature, it was reported that about 20% of those seeking help from cardiologists had normal coronary arteries, confirmed by coronary angiography [15]. They underwent numerous examinations due to their fear of undiscovered heart disease. When there was no evidence of CVD, or other organic cause (esophageal reflux, esophageal motor dysfunction, musculoskeletal issues) a psychiatrist was involved in further diagnose and treat-

ment. In our NCCP patients, we noticed a constant worry that a heart attack could occur, and they continued to take antianginal medications despite a lack of diagnose. The psychiatric examination included the unstructured clinical interview, SCL-90R questionnaire and heteroanamnesis' data from family members. Although their symptoms resembles somatoform and anxiety disorders, all criteria for psychiatric diagnose were not present. The most frequent symptoms were emotional and muscular tension, difficulties falling asleep, emotional irritability, conflicts in relationship with important persons and hypochondriac concerns.

In order to explore main difference from the CVD patients considering the psychological factors, the NCCP group was compared to the patients with the established coronary artery disease (previous myocardial infarction or arteriography, with diagnose of angina). The NCCP group consisted of younger patients, as expected. The neurotic fear of illness and anxiety syndromes usually occur in young adults, while atherosclerosis and myocardial ischemia are more frequent in middle age and elderly persons, as confirmed in literature [16, 17]. Health-risk behaviors were equally present in both groups, although we expected to be more frequent in the C group. Nicotine has a toxic effect on endothelium, accelerating atherosclerosis. Smoking increases risk or future cardiac event and mortality rate in older patients as confirmed on the Korean sample in a study of Ahn et al. [16] from 2016. Also, a lack of physical activity and a risk of alcohol consumption, are recognized pathological factors for poor medical outcome and health-related quality of life among the individuals without a diagnosis of cardiovascular disease. These self-harm behaviors are some psychological mechanisms for overcoming negative emotions and are associated with the symptoms of anxiety [18–20], that was also present in our sample of subjects with chest discomfort. The educational preventive measures might reduce the chance of future CVD, as shown in prospective 20 years long study of youth, where change in lifestyle behavior was linked to diminishing chance for heart disease in adulthood [18].

In both groups, no psychiatric diagnose was found according to the MINI and ICD-10 criteria. Other researches considered NCCP as somatic expression of anxiety, or panic attack [19, 20], or a symptom of other somatic illness [21]. The subjects in the NCCP group had somatic complains, but within the psychological dimensions of depression and hos-

tility, measured by the SCL-90R, questionnaire, they were more prominent in the K group (CVD) patients. This was in line with some other findings [21, 22]. In these researches, depressiveness and hostility were spotted as toxic emotions, playing a role at a psycho-physiologic pathway for coronary artery disease and acute cardiac events.

Other eight psychological symptoms (SCL-90R) were equally represented, but none of them reached clinically significant level. This finding confirmed absence of psychiatric disorders, not only in the CVD patients, but also in the subjects with NCCP as well. This was not in line with the study of Campbell et al. [1], where a psychiatric diagnose of NCCP included: anxiety disorder (AD), panic disorder (PD), somatoform disorder (SD) and mayor depressive disorder (MDD). Clinically, inner tension dominated in our subjects. The most of them had the anxiety, or somatization symptoms, hypochondriac preoccupations and dysphoria, lasting from few weeks to few months, without fullfield criteria for psychiatric diagnose. In the NCCP group, the level of distress was significantly higher (GSI and PSDI), which indirectly confirmed psychological mechanism associated with somatic sensations. The similar findings explained physical symptoms as somatic expression of distress in the alexthymic persons [23, 24]. In the NCCP group, the level of anxiety was moderate and the score on the H-R scale of life events was > 100. This finding indicated coexistence of physical sensations, anxiety symptoms and exposure to stress life events being different from the coronary patients who had levels of anxiety, depression and life events score within a normal range. Such result differs from other researches in which almost 20% of patients after myocardial infarction suffered from some form of depressive disorder [25], which had a negative influence on prognosis [25, 26]. In the C group, none of the patients asked for a psychological help after their coronary event.

Some researchers and cardiologists consider atypical chest pain as subclinical manifestation of CVD when associated with positive stress test [27]. The patients from the NCCP group, took medications prescribed by a cardiologist (betablockers, acetylsalicylic acid), despite the fact that CVD was not confirmed. We assumed their chest discomfort was in connection with the psychological characteristics. The regression analysis showed that the persons with the depression, hostility and global distress had a greater chance for non-cardiac chest pain. Exposure to undesirable life events in the previous year, moderate anxiety level and younger age were associated with NCCP, but none of the parameters had a predictive value in the multivariate analysis. All together, those psychological features and anxiety, coexisting with NCCP, indicated the pathophysiological mechanism of somatization related to NCCP [28]. It could be assumed that the persons with the negative affectivity (hostility, depression, anxiety, distress), without a psychiatric diagnose, expressed their inner tension on the somatic level. They could be in the psychosomatic double pathway: to develop psychiatric disorder, or heart disease in the future. They need psychological help to deal with their emotions efficiently in order to decrease chance for mental or cardiovascular disorder [29, 30].

There are several limitations of the generalizability of the findings in this study. A larger sample would be better to determine psychological features associated with sensations in chest without CVD. No psychological characteristics specific only for NCCP were present in the patients with heart disease. There was no follow-up to check if some of the features changed over time and whether some other cause of chest pain appeared. A longitudinal study is necessary to confirm a possible development of psychiatric or CVD disorders in our patients with non-cardiac chest pain. The findings would be more valuable if we compare our NCCP group results not only with coronary patients but with the healthy controls as well.

Conclusion

The results suggested that the patients who complained about chest pain without diagnose of cardiovascular disease, or other somatic illness, had none associated psychiatric disorder, but express a higher distress level, exposure to the negative life events in the previous year and moderate anxiety level. The patients with cardiovascular disease felt hostility and elevated depression. The younger age, the moderate anxiety and exposure to life events were predictive for non-cardiac chest pain. Psychological help could be of a benefit to prevent possible psychiatric issues in young people with non-cardiac chest pain.

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