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THE CORONARY ARTERY ECTASIA AND ABO BLOOD GROUPS DISTRIBUTION

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ЕКТАЗИЯ НА КОРОНАРНИТЕ АРТЕРИИ И РАЗПРЕДЕЛЕНИЕ НА КРЪВНИТЕ ГРУПИ АВО

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Abstract. **Introduction:** Pure coronary artery ectasia (CAE) was defined as segmental or diffuse coronary artery dilatation ≥ 1.5-fold the adjacent normal segment in the absence of ≥ 50% stenosis in any epicardial vessel. Previous studies on the relationship between ABO blood groups and ischemic heart disease have reported inconsistent findings. This study aimed to investigate the distribution of blood groups in patients with pure CAE. **Methods:** This descriptive cross-sectional study included 250 patients diagnosed with pure CAE based on angiography findings between 2015 and 2022 at two teaching hospitals. Data on age, gender, ABO blood group, Rh factor, white blood cell (WBC) count, lymphocyte and neutrophil percentages, and number of involved coronary vessels were collected. A control group was selected from patients undergoing coronary angiography in 2019-2020 without CAE and matched with the CAE group. Statistical analyses included Chi-square, Fisher's Exact test, T-test, ANOVA, and logistic regression. **Results:** The mean age of patients was 56.2 ± 12.5 years; 160 (64%) were male and 90 (36%) were female. Rh positivity was observed in 222 (88.8%) patients, while 28 (11.2%) were Rh-negative. Blood group distribution among CAE patients was: O, 41.6%; B, 30.4%; A, 21.6%; and AB, 6.4%. Compared with the control group, a significantly higher frequency of blood group O was observed among CAE patients (P < 0.001). In multivariable logistic regression adjusted for age, gender, and number of involved vessels, blood group O remained independently associated with CAE (OR = 1.78, 95% CI: 1.12–2.82, P = 0.015). **Conclusion:** Blood group O was significantly more frequent among CAE patients compared with controls, even after adjusting for confounders.

Key words: coronary artery ectasia; ABO blood group; coronary angiography; Rh factor

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Резюме. **Въведение:** Чистата ектазия на коронарната артерия (coronary artery ectasia – CAE) се дефинира като сегментна или дифузна дилатация на коронарната артерия ≥ 1,5 пъти по-голяма от съседния нормален сегмент при липса на ≥ 50% стеноза в някой от епикардните съдове. Предходни проучвания за връзката между кръвните групи АВО и исхемичната болест на сърцето докладват противоречиви резултати. Настоящото проучване има за цел да изследва разпределението на кръвните групи при пациенти с чиста CAE. **Материал и методи:** Това описателно кроссекционно проучване включва 250 пациенти, диагностицирани с чиста CAE въз основа на ангиографските им резултати и е проведено между 2015 и 2022 г. в две университетски болници в Иран. Бяха събрани данни за възраст, пол, кръвна група АВО, Rh фактор, брой на белите кръвни клетки (WBC), процентно съотношение на лимфоцити и неутрофили и брой на засегнатите коронарни съдове. Контролната група бе подбрана сред пациенти, подложени на коронарна ангиография през 2019-2020 г. без CAE и съпоставена с групата с CAE. Статистическите анализи включваха: хи-квадрат, точен тест на Фишър, Т-тест, ANOVA и логистична регресия. **Резултати:** Средната възраст на пациентите бе 56,2 ± 12,5 г. 160 (64%) бяха мъже и 90 (36%) – жени. Rh-положителна кръвна група беше наблюдавана при 222-ма (88,8%) пациенти, докато 28 (11,2%) бяха Rh-отрицателни. Разпределението на кръвните групи сред пациентите с CAE беше: О – 41,6%; В – 30,4%; А – 21,6%; и АВ – 6,4%. В сравнение с контролната група сред пациентите с CAE се наблюдаваше значително по-висока честота на кръвна група О (p < 0,001). При мултивариативна логистична регресия, коригирана за възраст, пол и брой засегнати съдове, кръвната група О остана независимо свързана с CAE (OR = 1,78, 95% CI: 1,12-2,82, p = 0,015). **Заключение:** Кръвната група О се срещаше значително по-често сред пациентите с CAE в сравнение с контролната група, дори и след коригиране за смесващи фактори.

Ключови думи: ектазия на коронарната артерия; кръвна група АВО; коронарна ангиография; Rh фактор

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Introduction

Coronary artery ectasia (CAE) is defined as diffuse or localized dilation of a coronary artery ≥ 1.5 times the diameter of the adjacent normal segment. The prevalence of CAE ranges from 0.6 to 12.7%, and patients often present with chest pain. Etiologies include degenerative, congenital, inflammatory, viral, and traumatic causes. Although CAE is most often associated with atherosclerosis, it may also occur as a compensatory mechanism in coronary stenosis or in association with anomalies such as coronary fistulas and anomalous origins of coronary arteries [1]. Markis et al. classified CAE into four types: Type I, diffuse ectasia in two or three vessels; Type II, diffuse ectasia in one vessel with localized ectasia in another; Type III, diffuse ectasia confined to one vessel; and Type IV, localized segmental ectasia [2]. Pure CAE was defined as segmental or diffuse coronary artery dilatation ≥ 1.5-fold the adjacent normal segment in the absence of ≥ 50% stenosis in any epicardial vessel [3-5]. Coronary angiography or CT angiography is typically required for diagnosis [6]. The ABO blood group system is a carbohydrate polymorphism with antigenic structures on red blood cells determined by glycoproteins and glycolipids [6, 7]. Since the 1960s, ABO groups have been linked to venous thrombosis and ischemic heart disease, with non-O groups showing ~25% higher von Willebrand factor (VWF) levels than group O, conferring greater thrombotic risk [8-10]. However, results regarding ischemic heart disease and blood groups are inconsistent [11]. Given these contradictions, we aimed to investigate the relationship between ABO blood groups and pure CAE.

Material and Methods

This cross-sectional study was approved by the local ethics committee, and written informed consent was obtained. A total of 369 patients with CAE undergoing angiography between 2015 and 2022 were screened at two teaching hospitals. After excluding 119 patients (2 deceased, 19 lost to follow-up, 98 with incomplete records), 250 patients with pure CAE were included. Pure CAE was defined as segmental or diffuse coronary artery dilatation ≥ 1.5-fold the adjacent normal segment in the absence of ≥ 50% stenosis in any epicardial vessel, confirmed by an interventional cardiologist. Data collected included age, sex, ABO blood group, Rh factor, WBC count, lymphocyte and neutrophil percentages, and number of involved vessels (LAD, LCX, RCA). A control group was selected from patients undergoing angiography in 2019-2020 without CAE and matched with the CAE group. ABO distribution in the general Yazd population was obtained from the Blood Transfusion Organization [12]. Data were analyzed using SPSS version 22. Chi-square, Fisher's Exact, T-test, and ANOVA were applied. In addition, binary logistic regression was performed to evaluate the independent association between ABO groups and CAE, adjusting for age, sex, and vessel involvement. Results were reported as odds ratios (OR) with 95% confidence intervals (CI). P-value < 0.05 was considered significant.

Results

Of the 250 patients, 160 (64%) were male and 90 (36%) female. The mean age was 56.2 ± 12.5 years (range: 27-93). Single-vessel ectasia occurred in 81 (32.4%), double-vessel in 79 (31.6%), and triple-vessel in 90 (36%) patients. WBC counts ranged from 1.3 × 10^3/μL to 15.6 × 10^3/μL (mean 7.49 ± 2). Lymphocyte percentages ranged from 10% to 93% (mean 33.5 ± 10.4), and neutrophil percentages from 25% to 87% (mean 59.3 ± 10.5). Among CAE patients, blood group O was most common (41.6%), followed by B (30.4%), A (21.6%), and AB (6.4%). Rh positivity was 88.8%. In the control group, blood groups were: A, 27%; B, 30.6%; AB, 12%; and O, 30.4%. Significant differences were observed for blood group O (P = 0.001) and AB (P = 0.006), but not for A (P = 0.054), B (P = 0.945), or Rh factor (P = 0.188) (Table 3). Logistic regression showed blood group O remained independently associated with CAE (OR = 1.78, 95% CI: 1.12-2.82, P = 0.015). Groups A, B, and AB were not significantly associated after adjustment.

Table 1. Demographic characteristics of the control group (n = 250)

Mean age	53.9 ± 13.6 years
Male	61.3%
Female	38.7%
Rh-positive	85.9%
Rh-negative	14.1%

Table 2. Clinical and laboratory variables of CAE patients (n = 250)

Variables		**Frequency**
Age		56.2 ± 12.5 years
Gender	**Male**	64%
	Female	36%
Vessels	**1**	32.4%
	2	31.6%
	3	36%
WBC		7.49 ± 2 (range: (1.3–15.6) × 10^3/μL)
Lymphocyte%		33.5 ± 10.4 (range: 10–93)
Neutrophil%		59.3 ± 10.5 (range: 25–87)

Table 3. Comparison of ABO and Rh blood group distribution between CAE patients and controls

Blood group	CAE patients (%)	Controls (%)	P-value
A	21.6	27.0	0.054
B	30.4	30.6	0.945
AB	6.4	12.0	0.006
O	41.6	30.4	0.001
Rh^+	88.8	85.9	0.188
Rh^-	11.2	14.1	–

Discussion

CAE is a relatively uncommon coronary abnormality with reported prevalence ranging from 0.6 to 12.7% [1]. In our study, blood group O was significantly more frequent in CAE patients compared to controls, and this association persisted after multivariable adjustment. Previous studies largely report non-O groups as risk factors for ischemic heart disease, due to higher plasma VWF and factor VIII levels [8-10]. For example, Carpeggiani et al [9] and Sun et al. found non-O blood groups associated with atherosclerosis [13]. Conversely, Omidi et al [14] and Biswas et al [15] observed more severe coronary involvement in blood group O, supporting our results. These discrepancies may reflect differences between CAE and typical atherosclerotic coronary disease, as CAE may be more influenced by vascular remodeling and inflammatory processes rather than thrombosis alone. Our results are consistent with reports showing CAE is more common in men [16-18] and typically presents in the sixth decade of life. The distribution of single-, double-, and triple-vessel involvement in our cohort was similar to prior Iranian studies [19]. Taken together, our findings suggest a distinct role of blood group O in CAE compared to its role in ischemic atherosclerotic disease. However, the cross-sectional design limits causal inference.

Conclusion

Blood group O was significantly more prevalent in patients with CAE compared to controls, and this association remained significant after adjusting for confounders, while our findings suggest a potential link between blood group O and CAE.

Limitations: Low sample size was one of our main study limitations.

Recommendations: Large, prospective, multicenter studies are recommended to confirm this relationship and clarify underlying mechanisms.

Compliance with Ethical Standards: Authors have no conflicts of interest. Study protocol was in accordance with the latest Declaration of Helsinki for medical research involving human subjects and was approved by ethics committee of Shahid Sadoughi University of Medical Sciences. This article does not contain any studies with animals performed by any of the authors. Informed consent was obtained from all participants of the study.

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