

Распространенность эктазии коронарных артерий и связанные с ней факторы у пациентов, перенесших коронароангиографию: наблюдательное сравнительное аналитическое исследование

Hayder Abdulateef Zghair Nassir¹, Ahmed Qasim Ibrahim Mohammed², Hassan Abdulrazzaq Swaid²

¹College of Medicine, University of Basrah. Басра, Ирак; ²Basra Health Directorate. Басра, Ирак

Цель. Определить распространенность, факторы риска и распределение эктазии коронарных артерий (ЭКА).

Материал и методы. Наблюдательное сравнительное аналитическое исследование было проведено в двух кардиологических центрах Ирака с февраля 2020 года по февраль 2021 года с участием 263 пациентов, перенесших коронароангиографию. Клинические данные и сердечно-сосудистые факторы были проанализированы с использованием логистической регрессии для выявления ассоциаций с ЭКА.

Результаты. ЭКА была выявлена у 14,8% пациентов, что выше, чем сообщалось в аналогичных исследованиях в регионе. Значимыми факторами риска ЭКА были мужской пол, пожилой возраст, анамнез ишемической болезни сердца (ИБС), семейный анамнез ИБС, курение, сахарный диабет 2 типа, артериальная гипертензия и гиперхолестеринемия. Среди вовлеченных сосудов чаще всего поражалась правая коронарная артерия (ПКА), за ней следовали огибающая ветвь левой коронарной артерии и левая передняя нисходящая артерия.

Заключение. Распространенность ЭКА среди населения Басры/Ирака была выше, чем во многих других странах. ЭКА, по-видимому, является многофакторным состоянием, связанным с традиционными сердечно-сосудистыми факторами, при этом ПКА является наиболее часто поражаемым коронарным сосудом.

Ключевые слова: заболевания коронарных артерий, атерэктомия, эктазия коронарных артерий, аневризма коронарной артерии, коронароангиография.

Отношения и деятельность: нет.

Поступила 17/10-2025

Рецензия получена 27/10-2025

Принята к публикации 16/01-2026



Для цитирования: Hayder Abdulateef Zghair Nassir, Ahmed Qasim Ibrahim Mohammed, Hassan Abdulrazzaq Swaid. Распространенность эктазии коронарных артерий и связанные с ней факторы у пациентов, перенесших коронароангиографию: наблюдательное сравнительное аналитическое исследование. *Кардиоваскулярная терапия и профилактика*. 2026;25(7):4656. doi: 10.15829/1728-8800-2026-4656. EDN: XDХЕНС

Coronary Artery Ectasia prevalence and factors associated with ectasia in patients undergoing coronary angiography: An observational comparison analytic study

Hayder Abdulateef Zghair Nassir¹, Ahmed Qasim Ibrahim Mohammed², Hassan Abdulrazzaq Swaid²

¹College of Medicine, University of Basrah. Basrah, Iraq; ²Basra Health Directorate. Basrah, Iraq

Aim. To determine the prevalence and risk factors of coronary artery ectasia (CAE), as well as the distribution of ectasia among the coronary vessels.

Material and methods. An observational comparison analytic study was conducted in two cardiac centers in Iraq from February 2020 to February 2021, involving 263 patients who underwent coronary angiography. Clinical data and cardiovascular factors were analyzed to identify associations with CAE using logistic regression.

Results. CAE was detected in 14.8% of the patients, a prevalence higher than that reported in similar studies in the region. Significant risk

factors for CAE included male sex, older age, history of ischemic heart disease (IHD), family history of IHD, smoking, diabetes mellitus type-II, arterial hypertension, and hypercholesterolemia. Among the affected vessels, the right coronary artery (RCA) was the most commonly involved, followed by the left circumflex artery (LCX) and left anterior descending artery (LAD).

Conclusion. The prevalence of CAE in the Basrah/Iraq population was higher than in many other countries. CAE appears to be a multifactorial condition caused by traditional cardiovascular factors, with the RCA being the most frequently affected coronary vessel.

*Автор, ответственный за переписку (Corresponding author):

e-mail: yaalaalbaiirmany@gmail.com

[Hayder Abdulateef Zghair Nassir* — F.I.C.M.S., C.A.B.M (Cardio), Associate Professor, ORCID: 0000-0002-4162-9652, Ahmed Qasim Ibrahim Mohammed — Lecturer, ORCID: 0009-0002-4593-7836, Hassan Abdulrazzaq Swaid — Lecturer, ORCID: 0009-0004-0437-4787].

Addresses of the authors' institutions: Department of Internal Medicine, College of Medicine, University of Basrah, Al-Baradhyiah, Kornish St. 13, 61007, Basrah, Iraq; Department of Medicine, Basra Health Directorate, Ministry of Health, Manawi St. 20, 61009, Basrah, Iraq.

Keywords: CA diseases, atherectomy, CA ectasia, CA aneurysm, coronary angiography.

Relationships and Activities: none.

Hayder Abdulateef Zghair Nassir* ORCID: 0000-0002-4162-9652, Ahmed Qasim Ibrahim Mohammed ORCID: 0009-0002-4593-7836, Hassan Abdulrazzaq Swaid ORCID: 0009-0004-0437-4787.

*Corresponding author: yaalaalbairmany@gmail.com

Received: 17/10-2025

Revision Received: 27/10-2025

Accepted: 16/01-2026

For citation: Hayder Abdulateef Zghair Nassir, Ahmed Qasim Ibrahim Mohammed, Hassan Abdulrazzaq Swaid. Coronary Artery Ectasia prevalence and factors associated with ectasia in patients undergoing coronary angiography: An observational comparison analytic study. *Cardiovascular Therapy and Prevention*. 2026;25(7):4656. doi: 10.15829/1728-8800-2026-4656. EDN: XDxEHC

CA — coronary artery, CAD — coronary artery disease, CAE — coronary artery ectasia, CI — confidence interval, DM — diabetes mellitus, HTN — hypertension, IHD — ischemic heart disease, LAD — left anterior descending artery, MI — myocardial infarction, RCA — right coronary artery.

Ключевые моменты

Что известно о предмете исследования?

- Эктазия коронарных артерий (ЭКА) — редкое сердечно-сосудистое заболевание (аномальное расширение коронарных артерий), распространенность которого составляет от 1 до 5% среди пациентов, проходящих коронароангиографию.
- В большинстве случаев у взрослых она имеет атеросклеротический генез, хотя существуют врожденные и связанные с воспалительным процессом формы.
- Изменение кровотока в эктатических сегментах может вызывать турбулентность кровотока, застой и образование тромбов, увеличивая риск ишемии или инфаркта миокарда даже при отсутствии обструктивных поражений.

Что добавляют результаты исследования?

- Исследование подтверждает, что традиционные сердечно-сосудистые факторы, такие как диабет, гипертония, курение, гиперхолестеринемия и семейный анамнез ишемической болезни сердца, тесно связаны с ЭКА.
- Это исследование уточняет метаболические факторы, которые действительно способствуют ЭКА, предотвращая переоценку риска, формирующуюся на основе не связанных с данной патологией параметров.
- Диагностика ЭКА у пациентов может помочь прогнозировать осложнения (например, тромбообразование, ишемию миокарда) и определять подходящую тактику лечения.

Key messages

What is already known about the subject?

- Coronary artery ectasia (CAE) is a rare cardiovascular condition (abnormal dilatation of the coronary arteries), with reported prevalence ranging from 1 to 5% of patients undergoing coronary angiography.
- The majority of adult cases are atherosclerotic in origin, although congenital and inflammatory causes also exist.
- Altered blood flow in ectatic segments can cause turbulence, stasis, and thrombus formation, increasing the risk of myocardial ischemia or infarction even without obstructive lesions.

What might this study add?

- The study reinforces the traditional cardiovascular factors like diabetes, hypertension, smoking, hypercholesterolemia, and family history of ischemic heart disease are strongly associated with CAE.
- This study helps refine which metabolic factors truly contribute to ectasia, preventing overestimation of risk from unrelated parameters.
- Recognizing CAE in patients may help anticipate complications (e.g., thrombus formation, myocardial ischemia) and guide management.

Introduction

Coronary artery ectasia (CAE) is a relatively rare coronary artery diseases (CAD) variant. It is characterized by abnormal portion enlargement or the entire length of a coronary artery (CA), measuring at least 1.5 times wider than a nearby normal segment. Ectasia is most often associated with atherosclerotic CAD [1, 2]. The incidence of CAE varies significantly, ranging from 0.3 to 12%, as observed in autopsy findings and

diagnostic techniques like coronary angiography or multi-detector computed tomography [3]. This variability largely depends on the methods used and the specific population studied [4].

There are several approaches to defining the CAE based on its severity and distribution. Various definitions have been proposed depending on the study methodology. Yang X, et al. [5] described ectasia as a CA segment greater than that of the adjacent normal

segment. Meanwhile, Sheikh AS, et al. [6] developed a classification system to categorize CAE based on the extent of arterial involvement: Type I (diffuse in two to three vessels), Type II (diffuse in one vessel and localized in another), Type III (diffuse in a single vessel), and Type IV (localized or segmental dilatation).

In adults, most cases of CAE and CA aneurysms are associated with atherosclerosis or result from vessel wall damage following coronary interventions such as stent placement, balloon angioplasty, and/or atherectomy [7]. In contrast, in early age groups, vasculitic conditions, particularly Kawasaki disease, are more frequent. Less commonly, coronary aneurysms may arise because of factors such as cocaine use or systemic infections [8]. Evidence also suggests a genetic predisposition to the development of both CAE and aneurysms [9].

Aneurysmal dilation often leads to turbulent (sluggish) coronary blood flow, increasing the risk of typical exertional myocardial infarction (MI) and angina irrespective of the associated stenosis. Individuals with isolated CAE — representing ~15% of cases — tend to have a relatively more benign prognosis. However, ~39% of these individuals still exhibit signs of previous MI [10].

Earlier research, which highlighted considerable flow disturbances in ectatic segments, proposed chronic anticoagulation as a primary treatment approach. However, this therapy has not been thoroughly tested in prospective studies; therefore, it cannot be recommended without further supporting evidence from future research. When CAE coexists with obstructive CAD, its prognosis and management are typically aligned with those of CAD alone. However, in cases of isolated CAE, prognosis tends to be more favorable, and antiplatelet therapy remains the cornerstone of treatment [11].

Evidence suggests that CAE may not be as benign as previously believed. The individuals with CA aneurysms presented with a significantly greater 5-year mortality rate, with an adjusted hazard ratio of 1.56 (95% confidence interval (CI): 1.01–2.41) [12]. Another study reported that 54% of patients with coronary aneurysms detected via computed tomography imaging experienced high adverse cardiovascular events over a median following-up of 4 years [13].

Doi T, et al. reported that CAE was independently associated with significantly increased risks of cardiac death (3-fold increase; $p=0.004$) and non-fatal MI (5-fold increase; $p<0.001$) [14].

Due to limited evidence, long-term anticoagulation therapy is typically reserved for high-risk patients, such as those with multivessel ectasia or those experiencing recurrent thrombotic events despite being on dual antiplatelet therapy. The common coexistence of CAE with obstructive lesions, coupled with the documented risk of MI in some cases, justifies the routine use of aspirin in all CAE patients [15].

Data on percutaneous coronary intervention in the context of incidental coronary aneurysms remain limi-

ted, mostly derived from small case series [16]. In acute coronary syndrome, percutaneous coronary intervention involving aneurysmal segments is associated with poor prognosis, including least procedural success, greater rates of no-re-flow and distal embolization, increased risk of stent thrombosis, need for frequent revascularization, and greater long-term mortality [17].

The aim of this study was to assess CAE prevalence among subjects who underwent coronary angiography and intervention, as well as the possible factors associated with ectasia. Anatomical distribution of vessels involved.

Methods

Study design and setting. An observational comparison analytic study was conducted in Ibn Al-Baitar and Al-Nasirya cardiac centers between February 2020 and February 2021, involving 263 patients who underwent elective and emergency coronary angiography.

Ethical approval. The Medical Ethical Committee of The Department of Medicine approved this study (no. 398 on 20-01-2019).

Coronary angiography intervention. Coronary angiography was performed based on clinical indications, such as a history of angina, prior or acute MI, or positive results from noninvasive diagnostic testing. Every patient underwent an ECG performed as a routine evaluation, and coronary angiography was performed using Philips devices in both centers, using (Seldinger) technique with the femoral or radial approach. The findings were interrupted by two senior interventional cardiologists during the procedure for every case [18, 19].

Data collection and excluding criteria. Patient data were collected by using a study-specific questionnaire. Individuals with congenital or valvular heart disease as well as cardiomyopathies were excluded from the study, as these conditions are more commonly associated with congenital forms of ectasia and arterial dilatation, according to previous reports.

Statistical analysis. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version-22. Categorical variables are presented as frequencies and percentages, and the associations between them were measured using Pearson's test. Logistic regression is a robust method for evaluating the relationship between one or more predictor variables (continuous or categorical) and the presence or absence of CAE. It estimates the odds ratio for each factor, and statistical significance is assessed through 95% CI. Continuous parametric data were compared between study groups using an independent two-tailed t-test with significant statistical p -value <0.05 .

Results

In total, 263 cases were included in this study who underwent coronary angiography, 39 patients had CAE in one or more vessels, while 224 were non-ectatic (did not have ectasia), with age (mean) of the non-ectatic group was (62.1 ± 9) years. The age (mean) of the ectasia group was greater, since CAE was more common in the older age group. Approximately, the non-ectatic group males to female ratio was 1.52:1, whereas in the ectatic group, it was 2.55:1. The non-ectatic group included patients with diabetes mellitus (DM) type-II greater by 3-folds

Table 1

Characteristic distribution of patients in the study

Variables		Non-ectatic group (n=224)	Ectasia group (n=39)	p
		n (%)		
Sex	Male	135 (60.2)	28 (71.8)	0.004
	Female	89 (39.8)	11 (28.2)	
Age, years		62.1±9	66±10	0.05
DM type-II		104 (46.4)	33 (84.6)	0.001
HTN		120 (53.5)	31 (79.4)	0.02
Smoking	Yes	89 (39.8)	30 (76.9)	0.01
	Ex-smoker	135 (60.2)	9 (23.1)	
Family history (positive)		93 (37)	33 (84.6)	0.033
Previous IHD		125 (54)	29 (74.4)	0.049
Hypercholesterolemia		108 (47.7)	35 (89.7)	0.001
Hypertriglycerimia		103 (45.9)	17 (43.6)	0.461
CAE		224 (85.2)	39 (14.8)	0.03

Note: CAE — coronary artery ectasia, DM — diabetes mellitus, HTN — hypertension.

Table 2

Logistic regression analysis of variables

Variables	Score	OR (95% CI)	p
Age, years	7.514	3.25 (1.455-10.801)	0.006
DM type-II	19.409	10.65 (5.308-20.977)	<0.001
HTN	33.964	12.87 (11.094-45.218)	<0.001
Smoking history	28.469	11.84 (10.532-30.471)	<0.001
Family history of IHD	35.260	20.61 (19.472-50.244)	<0.001
History of IHD	122.66	50.73 (58.124-200.417)	<0.001
Hypercholesterolemia	22.311	9.36 (8.555-35.198)	<0.001

Note: CI — confidence interval, DM — diabetes mellitus, IHD — ischemic heart disease, HTN — hypertension, OR — odds ratio.

than in the ectatic group. Regarding smoking habits, the non-ectatic group had active smoker cases more than in the ectatic group by 3-times. The non-ectatic group had cases with positive ischemic heart disease (IHD) family history more than the ectatic group, by 3-folds. History of IHD was presented more in the non-ectatic group than the ectatic group by 4-folds. Among healthy people, hypercholesterolemia was almost 3 times more common than in patients with ectasia (table 1).

The logistic regression analysis identified several significant factors. Increased age was significantly associated with elevated ectasia rate. DM, hypertension (HTN), smoking history, and IHD positive family history were also strong and statistically significant factors. Notably, a previous history of IHD showed the strongest association, indicating that patients with prior IHD were substantially more likely to develop the ectasia (table 2).

Among the study participants, involvement of the coronary arteries was most frequently observed in the right coronary artery (RCA), which was affected in 25 patients (64.1%). The left circumflex artery was involved in 17 patients (43.6%), while the anterior descending artery (LAD) was affected in 16 patients (41%). These findings indicate that RCA involvement was the most common among the coronary vessels assessed.

Discussion

In our study, CAE was more common (14.8%) than its prevalence in similar studies done across the world [20]. This high prevalence may be attributed to the elevated CAD prevalence and atherosclerosis conditions in the Middle East or may be attributed to the increased genetic predisposition to the development of CAE.

Ectatic patients were mostly over 40-years-old (65 to 70 years). CAE was predominant in males in this study. This finding is supported by previous studies that mentioned man dominance for CAE, with an M:F ratio of 2:1 [21]. However, this ratio was higher in a large study performed in Singapore (3:1), although the incidence of ectasia was less than that in this study [4]. This may be attributed to the fact that no exclusion criteria were mentioned in the study, while in our study, we mentioned valvular heart disease, congenital, and cardiomyopathy disease as exclusion criteria.

Overall, logistic regression in this study provided a structured and statistically rigorous approach to evaluate how each factor contributes to disease likelihood, highlighting the factor associated with ectasia such as prior IHD family history, HTN and DM type-II. A meta-analysis showed that DM was present in cases with CAE in percentage around 8-33% and

suggested DM as a protective against the development of CAE [22], while the incidence of DM in our study was higher at 84.6%). This may be due to the high prevalence of DM type-II in middle-aged people [23]. These results are supported by previous studies in our region [24].

In this study, a significant majority of patients with CAE — 79.4%) were found to have HTN, and 76.9% were current smokers. These factors for CAD align with findings from other studies, which have also shown a strong association between HTN, smoking, and CAE [25]. A significant number (74.4%) of cases had a positive history of IHD or presented with acute angina, these results come in line with the results presented by Nyamu P, et al. [25] and Demopoulos VP, et al. [26].

These observations may introduce ectasia as a factor for IHD and sudden cardiac death due to slow flow, coronary spasm, coronary dissection, and CA thrombosis [27]. We found that approximately 89.7% of cases had hypercholesterolemia on statin therapy. Our results revealed a significant correlation between hypercholesterolemia and ectasia. Many studies have also highlighted the prevalence of hypercholesterolemia among patients with CAE, with rates reported as 63% in Singapore, 59% in Saudi Arabia [24], and 41.7% in Iran [20]. These findings, including those from our study, are consistent with those of other studies that have shown a clear association between hypercholesterolemia and the presence of CAE, showing that this lipid disorder was very common in patients with coronary ectasia. However, patients with hypertriglyceridemia showed no statistical significance in terms of CAE, which is supported by many studies [28–32].

Consistent with previous studies, the RCA was the most frequently affected vessel in our study. However, Nyamu et al. found that the LAD was the most commonly affected vessel [25]. They also observed that ectasia in the LAD typically presented as discrete, whereas the RCA showed a more diffuse pattern of ectasia, a finding also noted in Demopoulos et al.'s study [26].

This study has several limitations that should be acknowledged. First, the study was conducted in two cardiac centers only, which may restrict the generalizability of the findings to the wider population. Second, angiographic assessment was used to diagnose CAE without intravascular imaging modalities, which could provide more precise measurements of ectatic segments. In addition, some potential confounding factors, such as inflammatory markers, lipid subfractions, or genetic predispositions, were not evaluated. Finally, the relatively small sample size may have limited the power to detect weaker associations. Despite these limitations, the study provides valuable insight into the prevalence and factors of CAE in the Iraqi population.

Conclusion

The CAE prevalence in the two Iraqi cardiac centers was higher than the expected level in the Middle East. The distribution of common CHD factors was the most prevalent in CAE subjects. Except for an increase in triglyceride levels, there was no statistical significance in this study. Future studies should aim to include larger, multicenter cohorts to improve the generalizability of findings and to better represent different regions and populations. The use of advanced imaging techniques such as intravascular ultrasound, optical coherence tomography, or coronary computed tomography angiography is recommended to provide a more accurate assessment of CAE morphology and extent. In addition, prospective cohort studies are needed to clarify the causal relationship between identified factors and CAE development. Further research should also explore the pathophysiological mechanisms underlying CAE, including the role of inflammation, endothelial dysfunction, and genetic susceptibility. Finally, studies assessing the long-term clinical factors associated with ectasia and optimal management strategies for patients with CAE would be valuable in guiding prevention and treatment approaches.

Relationships and Activities: none.

References

1. Fihn SD, Gardin JM, Abrams J, et al; American College of Cardiology Foundation/American Heart Association Task Force. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease. *Circulation*. 2012;126(25):e354–471. doi:10.1161/CIR.0b013e318277d6a0.
2. Mavrogeni S. Coronary artery ectasia: from diagnosis to treatment. *Hellenic J Cardiol*. 2010;51(2):158–63.
3. Lin C-T, Chen C-W, Lin T-K, Lin C-L. Coronary Artery Ectasia. *Tzu Chi Med J*. 2008;20:270–4. doi:10.1016/S1016-3190(08)60049-X.
4. Lam CS, Ho KT. Coronary artery ectasia: a ten-year experience in a tertiary hospital in Singapore. *Ann Acad Med Singap*. 2004;33(4):419–22.
5. Yang X, Zong Y, Zhang Z, et al. Identification of Potential Abnormal Methylation-Modified Genes in Coronary Artery Ectasia. *Int J Genomics*. 2023;2023:4969605. doi:10.1155/2023/4969605.
6. Sheikh AS, Hailan A, Kinnaird T, et al. Coronary Artery Aneurysm: Evaluation, Prognosis, and Proposed Treatment Strategies. *Heart Views*. 2019;20(3):101–8. doi:10.4103/HEARTVIEWS.HEARTVIEWS_1_19.
7. Kawsara A, Núñez Gil IJ, Alqahtani F, et al. Management of Coronary Artery Aneurysms. *JACC Cardiovasc Interv*. 2018;11(13):1211–23. doi:10.1016/j.jcin.2018.02.041.
8. Bavry AA, Chiu JH, Jefferson BK, et al. Development of coronary aneurysm after drug-eluting stent implantation. *Ann Intern Med*. 2007;146(3):230–2. doi:10.7326/0003-4819-146-3-200702060-00146.
9. Baker DW, Whitehead NJ, Barlow M. Mycotic Coronary Aneurysms. *Heart Lung Circ*. 2020;29(1):128–36. doi:10.1016/j.hlc.2018.12.004.
10. Abou Sherif S, Ozden Tok O, Taşköylü Ö, et al. Coronary Artery Aneurysms: A Review of the Epidemiology, Pathophysiology,

- Diagnosis, and Treatment. *Front Cardiovasc Med.* 2017;4:24. doi:10.3389/fcvm.2017.00024.
11. Baman TS, Cole JH, Devireddy CM, Sperling LS. Risk factors and outcomes in patients with coronary artery aneurysms. *Am J Cardiol.* 2004;93(12):1549-51. doi:10.1016/j.amjcard.2004.03.011.
12. Warisawa T, Naganuma T, Tomizawa N, et al. High prevalence of coronary artery events and non-coronary events in patients with coronary artery aneurysm in the observational group. *Int J Cardiol Heart Vasc.* 2015;10:29-31. doi:10.1016/j.ijcha.2015.10.005.
13. Joo HJ, Woong Yu C, Choi R, et al. Clinical outcomes of patients with coronary artery aneurysm after the first generation drug-eluting stent implantation. *Catheter Cardiovasc Interv.* 2018;92(3):E235-45. doi:10.1002/ccd.27429.
14. Doi T, Kataoka Y, Noguchi T, et al. Coronary Artery Ectasia Predicts Future Cardiac Events in Patients With Acute Myocardial Infarction. *Arterioscler Thromb Vasc Biol.* 2017;37(12):2350-5. doi:10.1161/ATVBAHA.117.309683.
15. Núñez-Gil IJ, Terol B, Feltes G, et al. Coronary aneurysms in the acute patient: Incidence, characterization and long-term management results. *Cardiovasc Revasc Med.* 2018;19(5 Pt B):589-96. doi:10.1016/j.carrev.2017.12.003.
16. Araiza-Garaygordobil D, Gopar-Nieto R, Sierra-Lara Martínez D, et al. Dual Antiplatelet Therapy Versus Antiplatelet Monotherapy Plus Oral Anticoagulation in Patients with Acute Coronary Syndrome and Coronary Artery Ectasia: Design and Rationale of OVER-TIME Randomized Clinical Trial. *High Blood Press Cardiovasc Prev.* 2022;29(5):463-8. doi:10.1007/s40292-022-00535-4.
17. Ovalı C, Morrad B. Associations between coronary artery disease, aneurysm and ectasia. *Kardiochir Torakochirurgia Pol.* 2017;14(3):158-63. doi:10.5114/kitp.2017.70276.
18. Grundy S, Stone N, Bailey A, et al. 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA Guideline on the Management of Blood Cholesterol. *J Am Coll Cardiol.* 2019;73(24):e285-350. doi:10.1016/j.jacc.2018.11.003.
19. Jafari J, Daum A, Hamed JA, et al. Low High-Density Lipoprotein Cholesterol Predisposes to Coronary Artery Ectasia. *Biomedicines.* 2019;7(4):79. doi:10.3390/biomedicines7040079.
20. Giannoglou GD, Antoniadis AP, Chatzizisis YS, et al. Prevalence of ectasia in human coronary arteries in patients in northern Greece referred for coronary angiography. *Am J Cardiol.* 2006;98(3):314-8. doi:10.1016/j.amjcard.2006.02.034.
21. Huang QJ, Liu J, Chen MH, Li JJ. Relation of diabetes to coronary artery ectasia: A meta-analysis study. *Anadolu Kardiyol Derg.* 2014;14(4):322-7. doi:10.5152/akd.2014.5327.
22. Mansour AA, Al-Maliky AA, Kasem B, et al. Prevalence of diagnosed and undiagnosed diabetes mellitus in adults aged 19 years and older in Basrah, Iraq. *Diabetes Metab Syndr Obes.* 2014;7:139-44. doi:10.2147/DMSO.S59652.
23. Almansori MA, Elsayed HA. CA ectasia — A sample from Saudi Arabia. *J Saudi Heart Assoc.* 2015;27(3):160-3. doi:10.1016/j.jsha.2015.03.005.
24. Malviya A, Jha PK, Mishra A. Isolated coronary artery ectasia: Clinical, angiographic, and follow up characteristics. *Indian Heart J.* 2017;69(5):619-23. doi:10.1016/j.ihj.2016.12.017.
25. Nyamu P, Ajit MS, Joseph PK, et al. The prevalence and clinical profile of angiographic coronary ectasia. *Asian Cardiovasc Thorac Ann.* 2003;11(2):122-6. doi:10.1177/021849230301100207.
26. Demopoulos VP, Olympios CD, Fakiolas CN, et al. The natural history of aneurysmal coronary artery disease. *Heart.* 1997;78(2):136-41. doi:10.1136/hrt.78.2.136.
27. Aboeata AS, Sontineni SP, Alla VM, Esterbrooks DJ. Coronary artery ectasia: current concepts and interventions. *Front Biosci (Elite Ed).* 2012;4(1):300-10. doi:10.2741/377.
28. Fariba F, Moradi M, Arabi A, Ghaderi B. Prevalence of CA Ectasia with Atherosclerosis and Associated Risk Factors in the West of Iran: A Cross-Sectional Study. *J Res Health Sci.* 2016;16(1):22-5.
29. Abbood AS, Nassir HAZ, Abdulbari A. Using Para-Hisian Pacing as Electrophysiological Maneuver to Categorized Supra Ventricular Tachycardia at Normal Resting ECG. *Cardiology in Belarus.* 2025;17(3):337-44.
30. Nassir HAZ, Hassan LF. Risk of acute kidney injury in elective percutaneous coronary intervention: A comparative study of radial and femoral access. *Ukrainian Journal of Nephrology and Dialysis.* 2024;81(1):18-26. doi: 10.31450/ukrjnd.1(81).2024.03.
31. Nassir HAZ, Abdulbari A, Abbood AS. Association of Fragmented Wide QRS Complex with Coronary Artery Disease in Patients with Left Bundle Branch Block. *Cardiology in Belarus.* 2024;16(3):302-12.
32. Al Atbee MYN, Hassan IE, Mnahi HN, et al. Prevalence of hyperuricemia among patients undergoing hemodialysis: Approach to understanding the risk factors. *Ukrainian Journal of Nephrology and Dialysis.* 2023;79(3):32-8. doi:10.31450/ukrjnd.3(79).2023.05.