RESEARCH ARTICLE

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Prevalence and Distribution of Coronary Artery Origin Anomalies: A Comparative Review of MDCT-Based Studies (2015-2025)

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Abstract

Objectives: Coronary artery origin variations are uncommon congenital anomalies, but their recognition is critical due to potential clinical consequences such as myocardial ischemia or sudden cardiac death. An original 2019 Turkish multidetector computed tomography (MDCT) study reported a 2.5% prevalence of coronary origin variations among 1,238 patients. We aim to update these findings with recent large-cohort data from the past decade, comparing prevalence rates and patterns of coronary origin anomalies across populations.

Methods: Large cohort studies and systematic reviews reporting the prevalence of anomalies of coronary artery origin in adult populations evaluated by coronary computed tomography (CT) angiography, between 2015 and 2023, were reviewed. The types and frequencies of variations in the selected studies were comparatively analyzed according to the classification used in the original Turkish study.

Results: In recent MDCT-based studies, the prevalence of anomalous coronary origin in adults has generally been reported as 1-3%. The most common variants are a separate left anterior descending artery - left circumflex artery ostia and right coronary artery arising from the contralateral sinus.

Conclusion: As demonstrated by the conducted studies, the prevalence of coronary artery origin anomalies is low but not negligible. Clinicians and radiologists should remain aware of these variations and utilize advanced imaging modalities to guide appropriate management or intervention when necessary.

Keywords: Coronary artery, variation, anomaly, MDCT, CTA, prevalence

Introduction

Coronary arteries are among the most common sites of vascular anatomical variants in the human body.[1] A coronary artery "anomaly" of origin is typically defined as a congenital variation in the origin and/or course of a coronary artery that deviates from normal anatomy.[1] In the general population, such anomalies are uncommon, with older invasive angiography data suggesting rates close to 1%.[2] Reports over the past several decades indicate that prevalence can vary widely - from below 0.5% to as high as 5-6%- depending on the study population and the imaging technique used. Autopsy studies tend to yield lower estimates (~0.2-0.3%), whereas dedicated imaging studies can detect higher rates (up to a few percent).[1] Clinically, most coronary origin anomalies are asymptomatic and discovered incidentally, but certain variants have serious implications. Anomalous coronary origins that course between the aorta and pulmonary trunk (interarterial course) or originate from the pulmonary artery [e.g. anomalous left coronary artery from the pulmonary artery (ALCAPA) or anomalous right coronary artery (RCA) from the pulmonary artery] can lead to myocardial ischemia, arrhythmias, or even sudden cardiac death - especially during exertion in young athletes. Indeed, coronary anomalies are recognized as a notable cause of sudden death in the young. Thus, identifying these variants before they cause complications is important.[1]

Multidetector computed tomography (MDCT) coronary angiography has emerged as a preferred noninvasive diagnostic tool for evaluating coronary anatomy. MDCT offers high-resolution, three-dimensional visualization of the coronary origins and course, enabling precise identification of anomalies that might be challenging to appreciate on conventional angiograms. The increasing use of coronary computed tomography (CT) in both the workup of chest pain and in health screenings has consequently led to more frequent recognition of incidental coronary variants.[3]

In 2019, Güven and Kantarcı[4] conducted a single-center Turkish study using MDCT to evaluate coronary artery origin variations in 1,256 adults. They identified 31 patients with anomalies, achieving a prevalence of 2.5%. The variants identified included high take-off, separate left anterior ascending artery (LAD), and left circumflex artery (LCx) origins,

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opposite sinus origins, and a single coronary artery. While slightly higher than previous reports, the prevalence was consistent with the literature, which indicates approximately 2% in the general population. Their findings reinforced the importance of recognizing such variants and demonstrated the utility of MDCT in accurately characterizing them.[4]

Since 2019, numerous large cohort studies and reviews have further explored coronary artery anomalies, facilitated by the widespread use of CT angiography.[3,5-8] The present work is designed as a narrative literature review rather than an original patient-based investigation. Using the 2019 Turkish study as a reference, this article updates the incidence rates of coronary origin anomalies, compares subtype frequencies among populations, and assesses consistencies or differences with recent evidence.[4] By explicitly adopting a narrative review format, the aim is to synthesize and contextualize the available data from recent large-cohort studies, rather than to perform a new statistical analysis. This study aims to clarify the current prevalence and dominant variants by summarizing contemporary data. Enhanced awareness will assist clinicians in recognizing these anomalies and guiding appropriate patient management.

Methods

Study Design

This study is a narrative literature review and comparative analysis. Rather than being based on a new patient cohort, this study is structured as an integrative research review and analysis. We followed a format analogous to an original investigation, using published data as our "sample". The methodology involved a systematic literature search and data extraction to characterize the prevalence of coronary artery origin variations in recent studies. The design and definitions from the original 2019 Turkish study were used solely as a reference framework to maintain consistency in anomaly categorization.

Literature Search

The literature search (PubMed, Google Scholar, 2015-2025) used terms such as "coronary artery anomaly," "variant of origin," and "CT angiography." We included adult studies reporting the prevalence of congenital coronary anomalies of origin/course, focusing on large cohorts, registries, and reviews. Key references were also searched. In total, about 50 studies were screened by title and abstract. Twelve met the criteria after full-text review, and four recent large MDCT-based cohorts from different regions were chosen for the table as they provided the most consistent prevalence data. Other important works, including large registries and meta-analyses, were not in the table but are discussed in the text.

Inclusion Criteria

We included studies that (1) evaluated coronary anatomy in a sizable population (preferably n>1,000 for robust prevalence estimates); (2) used imaging modalities capable of delineating coronary origin anatomy (such as MDCT angiography, conventional angiography, or MR angiography); and (3) reported the prevalence or number of coronary artery origin anomalies detected. If more than one study from the same population existed, the most recent and comprehensive dataset was preferred.

Data Extraction

For each eligible study, data on the sample size, study population characteristics, and number of coronary artery anomalies were extracted. Detailed breakdowns of anomaly subtypes were recorded when available. Variations in definitions (e.g., the height threshold for "high take-off") across studies were noted in the methods sections of each paper.

Statistical Analysis

The extracted data were tabulated to allow side-by-side comparison of overall anomaly prevalence and specific variant frequencies across studies. No formal meta-analysis or statistical pooling was performed, consistent with the narrative review design. Instead, a descriptive comparative approach was used. We assessed whether the differences in prevalence between studies fell within expected statistical variation (considering sample sizes) or suggested systematic factors (such as regional genetic differences or imaging modality sensitivity).

Quality and Bias Consideration

Each study was specifically assessed for selection bias (e.g., symptomatic vs. general populations). We carefully considered whether myocardial bridging was included in the study because its inclusion may increase prevalence. Our analysis focused solely on anomalies of origin. No new patient data were used, so IRB approval was not required. All included studies underwent peer review with the assumption of ethical oversight.

Ethical Considerations

All coronary CT angiography images (Figures 1-4) are original cases from the authors' institutional archive, acquired on a Siemens Somatom Definition Flash, 128-slice MDCT scanner, as part of routine diagnostic workup. Images were selected to illustrate specific anomaly types discussed in this review. No patient identifiers are present, and all images were fully anonymized prior to inclusion. The study was conducted with approval from the Erzincan Binali Yıldırım University Non-Interventional Clinical Research Ethics Committee (decision no: 2024-10/07, date: 03.07.2024). Written informed consent for this use was obtained during the initial review.

Statistical Notes

Where relevant, we comment on differences in prevalence in light of sample size (e.g., using the binomial confidence intervals to judge if differences are statistically significant). No new statistical tests were performed on combined data, but we cited any statistical comparisons reported in the original studies or reviews (for example, comparisons of anomaly rates between imaging modalities or populations). All numerical results from the literature are accompanied by citations to their sources.

By employing the above methods, this narrative review aims to provide a rigorous and up-to-date comparison of coronary artery origin variation data, placing recent findings in the context of previous literature rather than generating new patient-level data.

Results

Study Selection

Our search identified more than 50 studies on coronary artery anomalies published in the last decade. We selected approximately a dozen key sources reporting prevalence data, including six recent single-center CT angiography studies from various regions and two major reviews (one systematic and one narrative). Table 1 compares four of these with the 2019 Turkish reference study.[3-5,8] The selected studies for the table provide a geographic and methodological spread: two from Türkiye (including the reference study), one from Greece, and one from Iran, all using MDCT, with sample sizes ranging from ~1,200 to ~5,200 patients.[3-5,8]

Overall Prevalence

Across the surveyed literature, the prevalence of coronary artery origin anomalies detected by MDCT angiography in adult populations generally falls between about 1% and 3%. This aligns well with the reference value of ~2% often cited in the context of coronary anomalies. For instance, Graidis et al.[3] in Greece reported 60 anomalous cases among 2,572 CT patients - an incidence of 2.33%. Gräni et al.[6] in Switzerland found an incidence of 2.6% in a CT cohort of 5,634, one of the largest CT series to date. A 2022 Turkish MDCT study by Şahin and İlgar[8], involving 5,200 patients, yielded an overall anomaly prevalence of 2.61% (136 patients), remarkably close to the smaller 2019 Turkish study's 2.5%.[4] On the other hand, slightly lower rates have been documented in some populations: Andishmand et al.[5] reported 1.26% in 3,016 Iranian patients undergoing CT, and Al-Umairi et al.[7] found 1.3% in 4,445 Omani patients. Notably, these differences might reflect sample characteristics (e.g., referral patterns or ethnic/genetic factors) or could arise from the handling of variants like myocardial bridges. In support of the latter, it's worth noting that if myocardial bridging (a common benign variant) is excluded, the prevalence numbers tend to cluster closer to ~1-2%, whereas including bridging can raise the "anomaly" rate substantially.

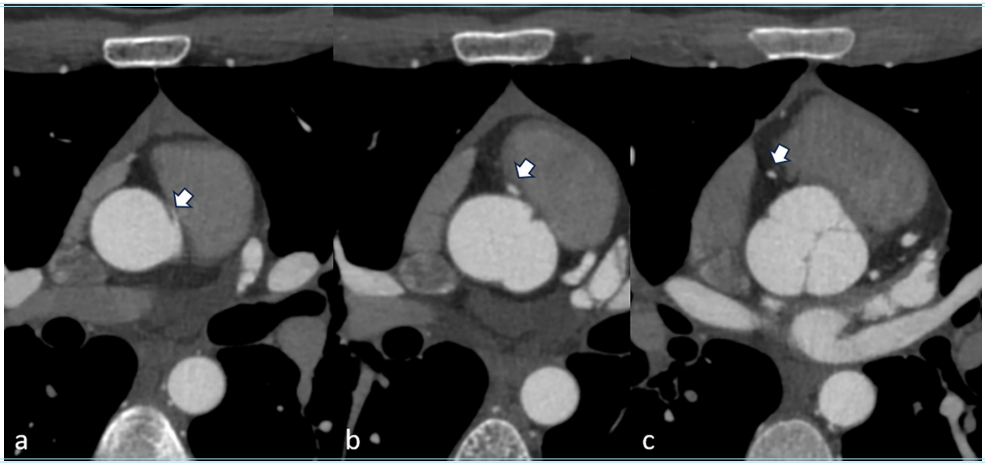

Figure 1. This is a case showing an anomalous RCA originating from the left main coronary artery and having an interarterial course. (a, b, c) Axial CT angiography images show that the RCA originates from the left main coronary artery, (white arrows) coursing between the great vessels

RCA: Right coronary artery, CT: Computed tomography

Table 1. Comparison of coronary artery origin variation frequencies across selected studies (values are % of total patients)

Study (year)	Population (N)	Any origin anomaly (%)	High take-off RCA/ LCA (%)	Separate LAD-LCx (%)	RCA from left sinus (%)	LCx (or LCA) from right sinus (%)	Single coronary (%)	Origin from pulm. A (%)
Güven and Kantarcı[4] (2019) -Türkiye	1,256 patients (CT)	2.50%	0.16/0.40	0.64	0.48	0.16 (LCx)+0.24 (LCA)*=0.40	0.08	0.00
Graidis et al.[3] (2015) - Greece	2,572 patients (CT)	2.33%	0.62/0.08**	0.58	0.35	0.23 (LCx)+0.08 (LCA)*=0.31	0.12	0.04
Şahin and İlgar[8] (2022) - Türkiye	5,200 patients (CT)	2.61%	0.06/0 (RCA/LCA)**	0.23	0.27	0.04 (LCx)+0.02 (LCA)*=0.06	0.04	0.02
Andishmand et al.[5] (2023) - Iran	3,016 patients (CT)	1.26%	–/– **(combined not reported)**	0.33***	0.30***	0.20***	0.03***	0.00

*LCx vs LCA from right sinus: Some studies distinguished an LCx branch origin vs an entire LCA trunk origin from the right sinus. For simplicity, both are combined here as "any left-system origin from right sinus." For example, Güven and Kantarcı[4] reported 0.16% LCx-from-right and 0.24% LCA-from-right, totaling 0.40%. Graidis et al.[3] similarly noted separate LCx (0.23%) and an LCA trunk (0.08%) from the right side. Şahin and İlgar[8] had 2 LCx (0.04%) and 1 LCA (0.02%) from the right.

LCA high take-off: Graidis et al. reported a small number of high-takeoff left main cases (0.08%), whereas others had none or included them in "high take-off" combined. The Greek study also noted 0.08% had both RCA and LCA high.

Andishmand et al.[5]: Detailed breakdown was not explicitly provided in the abstract; values marked with *** are approximate, inferred from incidence statements or typical patterns. The Iranian study's total 1.26% suggests fewer anomalies across the board, roughly 0.3% for common ones. They reported the most frequent anomaly was separate LAD/LCx (~0.3%), and RCA from left in ~0.28%, consistent with the table.

RCA: Right coronary artery, CT: Computed tomography, LCA: Left anterior descending artery, LAD: Left anterior ascending artery, LCx: Left circumflex artery

Variation Types and Frequencies

The spectrum of coronary origin variations observed was comparable across studies, with some variations consistently more frequent than others. In the Turkish 2019 study, high take-off was observed in 0.16% for the RCA, and 0.40% for the left anterior descending artery (LCA), the separate LAD-LCx origins in 0.64%, and the RCA from the left sinus in 0.48%. The LCx or LCA originating from the right sinus was seen in 0.40% (0.16% LCx+0.24% LCA), a single coronary artery in 0.08% was seen, and a pulmonary artery origin in 0.00% was seen.

In the Greek 2015 cohort: high take-off was 0.62% for RCA and 0.08% for LCA, separate LAD-LCx origins 0.58%, RCA from the left sinus 0.35%, LCx/LCA from the right sinus 0.31% (0.23% LCx+0.08% LCA), single coronary artery 0.12%, and pulmonary origin 0.04%.

In the Turkish 2022 series, high take-off was 0.06% for RCA (no LCA high take-off reported), separate LAD-LCx 0.23%, RCA from the left sinus 0.27%, LCx/LCA from right sinus 0.06% (0.04% LCx+0.02% LCA), single coronary artery 0.04%; and pulmonary origin 0.02%.

In the Iranian 2023 study, the percentages for various anomalies were as follows: separate LAD-LCx was 0.33%; RCA from the left sinus, 0.30%; LCx/LCA from the right sinus, 0.20% (breakdown not specified); single coronary artery, 0.03%; and pulmonary origin, 0.06% (1 case). High take-off values were combined or not reported in detail.[3,4,8]

Table 1 presents a comparative summary of coronary origin anomaly frequencies across the reference study and three other cohorts. Despite minor variations, a consistent pattern emerges: ~0.5% for LAD/LCx arising separately, ~0.3-0.5% for RCA arising from the left sinus, ~0.1-0.3% for LCx arising from the right sinus, ~0.1-0.4% for high take-off origins, and ≤0.1% for single coronary or pulmonary artery origins. Total prevalence remains within the 1-3% range. Differences, such as a higher rate of LCA high take-off or absence of LCxfrom RCA, likely reflect sampling or reporting variations. Overall, recent studies reaffirm the original findings on prevalence and distribution.[3-5,8]

This is a case showing an anomalous RCA originating from the left main coronary artery and having an interarterial course (Figure 1a-c). Axial CT angiography images show that the RCA originates from the left main coronary artery, (white arrows) coursing between the great vessels.

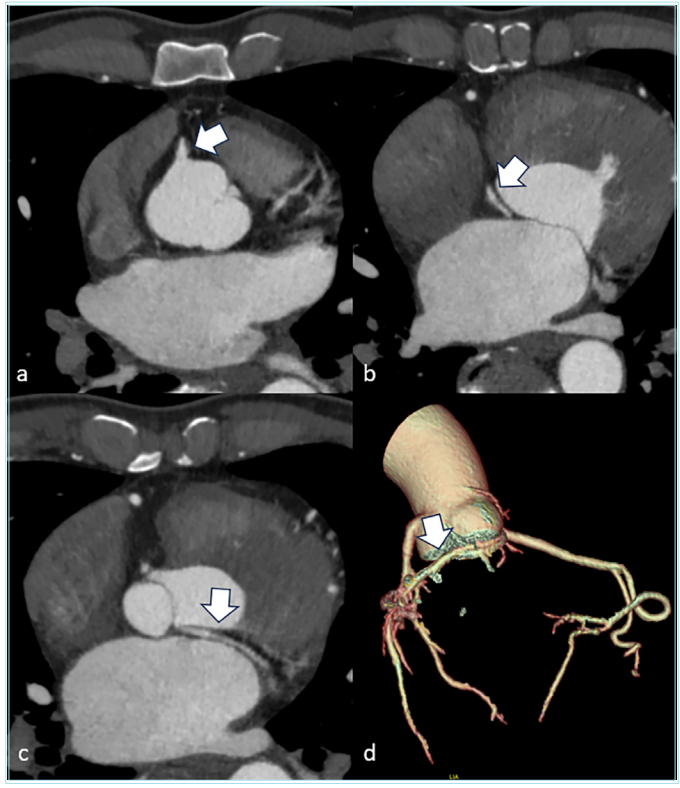

Figure 2. The patient demonstrates an anomalous LCx originating from a separate ostium in the right coronary sinus with a retroaortic course. Axial CT angiography images (a-c) and the 3D volume-rendered CT image (d) illustrate the LCx artery's path (white arrows) arising from the right coronary sinus and coursing posteriorly around the aorta

CT: Computed tomography, LCx: Left circumflex artery

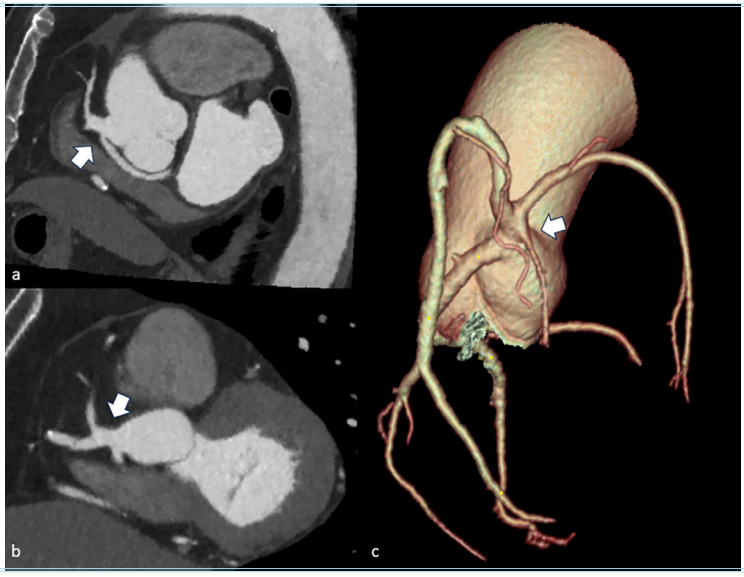

Figure 3. The patient has a single coronary ostium anomaly. (a, b) Sagittal reformatted CT angiography and (c) 3D volume-rendered CT images demonstrate all coronary arteries originating from a single ostium located in the right coronary sinus (white arrows)

CT: Computed tomography

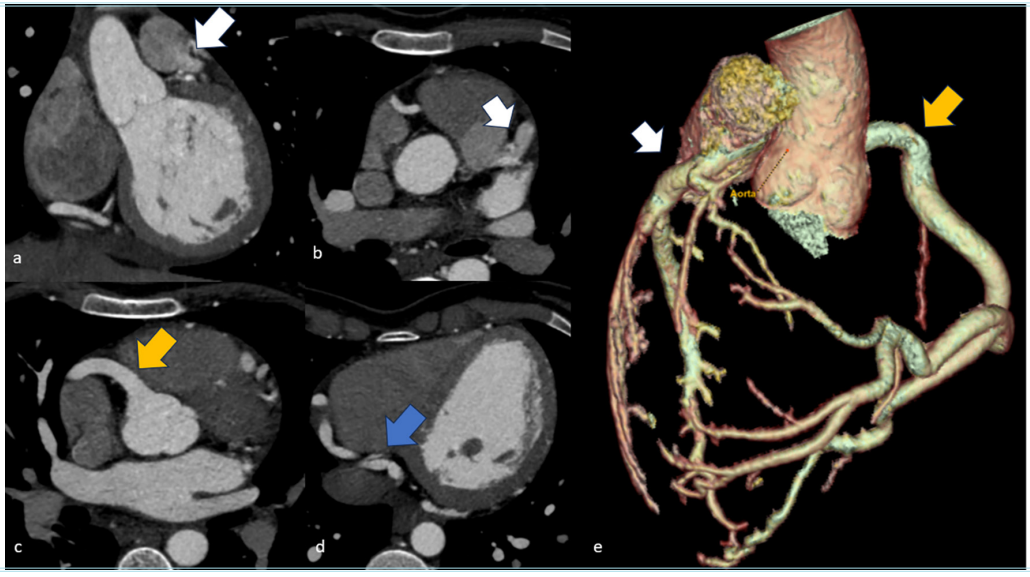

Figure 4. Case demonstrating anomalous origin of the LAD from the pulmonary artery (variant of ALCAPA). (a) Coronal and (b) axial CT angiography images show the LAD originating from the pulmonary artery (white arrows). (c) Axial image demonstrates marked dilatation of the RCA (yellow arrow). (d) Axial image reveals interarterial collateral vessels (blue arrow). (e) 3D volume-rendered CT image clearly illustrates the pulmonary origin of the LAD (white arrow) and the dilated RCA (yellow arrow)

RCA: Right coronary artery, CT: Computed tomography, LAD: Left anterior ascending artery, ALCAPA: Anomalous left coronary artery from the pulmonary artery

The patient demonstrates an anomalous LCx originating from a separate ostium in the right coronary sinus with a retroaortic course (Figure 2). Axial CT angiography images (a-c) and the 3D volume-rendered CT image (d) illustrate the LCx artery's path (white arrows) arising from the right coronary sinus and coursing posteriorly around the aorta.

The patient has a single coronary ostium anomaly (Figure 3a, b). Sagittal reformatted CT angiography and (c) 3D volume-rendered CT images demonstrate all coronary arteries originating from a single ostium located in the right coronary sinus (white arrows).

Case demonstrating anomalous origin of the LAD from the pulmonary artery (variant of ALCAPA) (Figure 4). (a) Coronal and (b) axial CT angiography images show the LAD originating from the pulmonary artery (white arrows). (c) Axial image demonstrates marked dilatation of the RCA (yellow arrow). (d) Axial image reveals interarterial collateral vessels (blue arrow). (e) 3D volume-rendered CT image clearly illustrates the pulmonary origin of the LAD (white arrow) and the dilated RCA (yellow arrow).

Discussion

The findings from our updated literature review confirm and extend the understanding of coronary artery origin variations, placing the 2019 Turkish MDCT study's results in a broader context. The slightly higher incidence found by CT can be attributed to the modality's greater sensitivity for detecting small or incidental anomalies that angiography might overlook. The original study's reported rate of 2.5% is very much in line with other MDCT-based investigations around the world.[4] In fact, several large series using contemporary CT technology have converged on prevalence figures between 1% and 3%. In addition to the four MDCT-based cohorts presented in Table 1, other large registries and recent meta-analyses have reported prevalence rates that are comparable or slightly lower, supporting the general range observed in our review. This convergence is noteworthy because older studies using different methodologies (e.g., invasive angiography, autopsy) sometimes reported lower overall rates, typically around 0.5-1.5%.[9] The slightly higher incidence found by CT can be attributed to the modality's greater sensitivity for detecting small or incidental anomalies that angiography might overlook. For example, a high-origin coronary ostium or a separate small ostium for an LCx might be missed or misinterpreted in a complex catheterization, but would be clearly seen on a 3D volume-rendered CT image. Thus, the proliferation of MDCT angiography in the last decade has likely led to more frequent recognition of otherwise quiescent coronary variants.

Despite methodological differences, the distribution of coronary anomalies remained consistent across studies and regions. The most common anomalies were benign variants, such as the separate origin of the LAD and LCx (absence of the left main artery), or origin of the RCA/LCx from the opposite sinus. Although generally asymptomatic, these variants can still have procedural relevance. For example, a high take-off coronary ostium may complicate selective cannulation during invasive angiography, and a retroaortic LCx may be at risk of inadvertent injury during aortic valve surgery. Awareness of such anatomy can prevent misinterpretation on imaging and help in pre-procedural planning.

Coronary anomalies arising from a single coronary artery or pulmonary artery are associated with serious outcomes but are extremely rare. Various studies have reported only one to two cases of a single coronary artery in several thousand patients. When identified, their course should be evaluated, as interarterial trajectories carry a higher risk and may require surgical intervention. ALCAPA, although rare in adults, requires surgical intervention due to its physiological incompatibility. In both ALCAPA and interarterial-course anomalies, early surgical correction-such as reimplantation or unroofing-is generally recommended if ischemia risk is present, even in asymptomatic individuals. Non-invasive imaging with CT or cardiac MR is preferred for defining the course and guiding management decisions. Consistent with their rarity

in elective CT populations, these high-risk anomalies were either absent or represented by isolated cases in the studied cohorts.

One interesting point of discussion is the influence of population and referral bias on reported prevalence. The 2019 Turkish study and most others were hospital-based cohorts of patients undergoing CT angiography due to suspected coronary disease or other risk factors. Such cohorts might have a slightly different anomaly prevalence than an unselected general population. One might hypothesize, for instance, that individuals with certain anomalies (particularly malignant) would either not survive to older ages or would present with symptoms that lead to early invasive investigation instead of elective CT later. However, the data did not show a dramatic difference between symptomatic cohorts and more general ones; the rates from symptomatic patient studies (like, the Iran 2023 and Türkiye 2022 studies, which were mostly patients with chest pain or risk factors) were in the same ballpark as those from broader groups.[5,8] If anything, the Iranian study's 1.26% was on the lower side, despite involving symptomatic patients, and the authors did not report any significant selection factor that would lower anomalies - this could simply be random variance, or slightly stricter criteria for what counted as an anomaly.[5] On the other hand, some reviews have suggested that because CT angiography is often performed in relatively healthy or low-risk patients (to rule out disease), it might incidentally pick up more benign anomalies than an invasive angiography series that usually focuses on people with coronary disease. Indeed, invasive angiograms historically might under-sample young healthy individuals (where anomalies might be found by chance) and over-sample older patients with atherosclerosis (where anomalies might be less frequent aside from those that cause clinically significant issues). The systematic review by Gentile et al.[1] noted that the anomaly prevalence reported in CT studies is at the higher end of the spectrum compared to that in catheter studies, supporting the notion that modality and population differences matter.

The inclusion of myocardial bridging as an anomaly in some studies is another point. Although a common coronary variant, bridging is an intramural anomaly, not an initial variant, and is usually analyzed separately. The 2019 Türkiye study focused solely on initial (ostial) anomalies, excluding bridging from the 2.5% prevalence rate.[4] However, other works, like Arjmand's 2012 CT angiography study from Iran, found bridging in 21% of patients and labeled it the most frequent variant.[10] When bridging is counted, it can dwarf the prevalence of true origin anomalies (as seen in Gilan 2025: 6.8% bridging vs 1.6% other anomalies).[11] In this article, we focused on anomalies of origin to ensure fair comparison with the reference study. This distinction is important because prevalence rates vary depending on whether bridging is included or not. While anomalies of origin remain low (approximately 1% to 3% percent), bridging can increase the total variant prevalence to approximately 5% to 8% percent. Bridging is generally benign and is not associated with ostial anomaly rates.

The clinical ramifications of detecting a coronary origin variation largely depend on the specific anomaly. Our updated review reinforces that most detected anomalies are benign , by themselves, do not necessitate intervention. Most detected coronary origin anomalies, such as high take-off, separate LAD/LCx origins, and retroaortic LCx, are benign and generally require only patient education and documentation to guide future invasive procedures. Nonetheless, documenting such variants in the radiology report is essential, as they may influence future diagnostic pathways or interventions. Communication between radiologists, cardiologists, and surgeons ensures that these findings are considered in the clinical context.

Malignant coronary anomalies, such as those with interarterial courses, are clinically important because of their potential for sudden cardiac death. While such outcomes were not directly reported in our adult studies reviewed, previous literature suggests that up to 30-50% of left main anomalies may present with sudden death as the first symptom. Early diagnosis enables prophylactic interventions such as reimplantation or re-roofing. Malignant anomalies were a minority in our data; for example, 14 of 136 anomalies in a 2022 Turkish series were RCA anomalies originating from the left sinus with interarterial courses, and warranted further evaluation. Others, such as retroaortic circumflex arteries, were treated conservatively. For malignant variants, individualized management is advised, with surgical intervention considered when there is evidence of ischemia, malignant course anatomy, or high-risk patient profile. Follow-up with functional testing or imaging may be warranted even in patients managed conservatively.8

When comparing the 2019 study to newer ones, there was no stark contradictions; instead, a high degree of agreement was observed. The slight differences (such as the Iranian study's lower anomaly percentage) can be explained as above.[4,5] One could also speculate about genetic or ethnic factors: for example, could Turkish populations have a marginally higher incidence of certain variants than another population? Some older studies hinted at geographic variation (one cited range was 0.3% to 5.6% in literature,) but given the consistency among Türkiye, Greece, and Switzerland in our table, any ethnic effect seems small if present at all.[3,4,6] It is more likely that methodological factors and sample criteria explain variations in reported rates. The systematic review by Fuenzalida et al.[12] essentially pooled global data and found an average prevalence around 1% for coronary origin anomalies. That average includes many studies that might not have counted things like high take-off or separate conus branches, whereas studies that specifically looked for any tiny anomaly using CT found closer to 2-3%. Therefore, we can conclude that the true prevalence in the general population probably lies in the 1-2% range, and that the Turkish study at 2.5% is at the higher end but still credible given its thorough CT-based detection.

Recent advancements and long-term outcomes are being emphasized in the context of analyzing abnormalities and expanding management. Large registries and trackers, such as the American Heart Association, now provide guidance on which abnormalities require surgery, which can be monitored, and how to counsel patients throughout their lifetime, including athletes. Increased CT-based detection allows for better case allocation and follow-up. Benign abnormalities do not appear to have a significant impact on survival or patient risk, as evidenced by similar atherosclerosis rates in affected and normal arteries. Early diagnosis of malignant abnormalities improves patient outcomes and prognosis by ensuring timely administration .

In summary, the discussion confirms that the original 2019 study's message-that coronary artery variants occur in roughly 2% of people and can be reliably detected by MDCT-holds true in the context of the latest research. If anything, the subsequent literature has reinforced the utility of MDCT, expanded the sample sizes, and provided outcome-oriented data. There is now strong multi-center evidence that MDCT angiography should be considered the preferred diagnostic modality when a coronary anomaly is suspected or when non-invasive imaging is needed to delineate an anomalous course seen on another test. The comparative analysis also alleviates any concern that the 2.5% figure

was an outlier; on the contrary, it fits the pattern seen in similar patient groups globally.

Conclusion

Coronary artery origin variations, though rare, represent an important category of cardiac anatomical anomalies with implications for clinical practice. Based on recent large-scale studies and reviews from the past decade, the prevalence of such anomalies detected with modern imaging ranges between 1% and 3% in adults, most often close to 2%.This updated literature perspective validates the findings of the 2019 Turkish MDCT study, which reported a 2.5% prevalence of origin variations, placing the study's findings in line with international data. Small differences in prevalence between studies are more likely due to variations in methodology, patient selection, or anomaly definitions than to true population differences.[3-8]

In terms of the types of anomalies, the distribution has remained consistent: the most frequently encountered variants are benign ones such as high take-off coronary ostia, separate LAD and LCx origins, and coronaries arising from the opposite aortic sinus. These constitute the majority of cases and typically do not cause symptoms, but their recognition can prevent diagnostic errors and guide procedural planning. Rarer anomalies, like a single coronary artery or an anomalous origin from the pulmonary artery, are found in only ~0.05-0.1% or fewer individuals, yet are of high clinical significance when present.

Multi-detector CT angiography has proven to be a reliable and often preferred modality for evaluating suspected coronary anomalies. Evidence consistently shows that MDCT can identify virtually all clinically important anomalies of origin with excellent spatial resolution, as reflected by the high diagnostic success reported across multiple studies. This is a noteworthy advancement from prior eras when diagnostic cardiac catheterization was required; CT now offers a noninvasive alternative that not only identifies the anomalous origin but also vividly depicts its course relative to other cardiac structures. As the role of CT expands in both the assessment of chest pain and preventive screening, the incidental discovery of coronary variants is expected to rise, further refining prevalence estimates and clinical awareness.

In summary, coronary artery origin anomalies are uncommon but present across populations at a consistent low rate. While most are benign and pose little clinical risk, a subset carries significant danger, making early and accurate detection essential.[3-8] Continued research, including pooled registries and meta-analyses, is warranted to better understand the long-term outcomes associated with each anomaly type and to guide management decisions. For clinicians and radiologists, staying alert to these anomalies and applying appropriate imaging strategies can ensure recognition and enable timely intervention when necessary.

Ethics

Ethics Committee Approval: The study was conducted with approval from the Erzincan Binali Yıldırım University Non-Interventional Clinical Research Ethics Committee (decision no: 2024-10/07, date: 03.07.2024).

Informed Consent: Since the study was a retrospective study, informed consent was not required by the ethics committee.

Footnotes

Authorship Contributions

Surgical and Medical Practices: T.K., E.Z., K.B., Concept: T.K., E.Z., K.B., Desing: T.K., E.Z., K.B., Data Collection or Processing: T.K., E.Z., K.B., Analysis or Interpretation: T.K., E.Z., K.B., Literature Search: T.K., E.Z., K.B., Writing: T.K., E.Z., K.B.

Conflict of Interest: No conflict of interest was declared by the authors.

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