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Research Article

Evaluation of Renal Artery Stenosis in Coronary Artery Bypass Grafting Candidates (A Cross-Sectional Study)

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Abstract

Introduction: Renal artery stenosis (RAS) is associated with adverse outcomes after major cardiovascular surgery. This study aimed to determine the prevalence of RAS among patients referred for coronary artery bypass grafting (CABG) and to evaluate the influence of cardiovascular risk factors on its occurrence.

Methods: This cross-sectional study was conducted at Damascus University Hospitals between May 2017 and May 2018. A total of 200 patients referred for CABG based on anatomical and clinical criteria were enrolled. Coronary and renal angiography were performed during the same session by interventional cardiologists. Significant RAS was defined as ≥50% luminal narrowing. Cardiovascular risk factors were documented, and data were analyzed using SPSS version 23. Normality was assessed using the Kolmogorov-Smirnov test, and homogeneity of variance using Levene's test.

Results: Among the 200 patients, 46 (23%) were female, with a mean age of 62.8 ± 9.0 years (range, 40–81 years). Significant RAS was identified in 40 patients (20%). Lesions were most commonly located in the main renal artery (63%), followed by the ostium (26%). RAS was significantly associated with female sex, systemic hypertension, diabetes mellitus, and left main coronary artery stenosis (all $P < 0.05$).

Conclusion: The prevalence of RAS among high-risk patients referred for CABG was 20%, with significant associations to specific demographic and clinical factors. These findings support consideration of routine RAS screening in CABG candidates, particularly those at elevated risk.

Abbreviations

RAS: Renal Artery Stenosis; CABG: Coronary Artery Bypass Grafting; HTN: Hypertension; DM: Diabetes Mellitus; LVEF: Left Ventricular Ejection Fraction; PVD: Peripheral Vascular Disease; CVA: Cerebrovascular Accident; ANOVA: Analysis of Variance

Introduction

Renal artery stenosis (RAS) typically reflects extrarenal large-vessel disease, with atherosclerosis accounting for the majority of cases [1]. Rather than an isolated renal abnormality, RAS represents a shared pathological process involving both the aorta and renal arteries.

Historically, RAS was underdiagnosed and undertreated; however, advances in noninvasive imaging modalities—including computed tomography, magnetic resonance imaging, and Doppler ultrasonography—have substantially improved diagnostic yield [2]. Atherosclerosis is responsible for approximately 90% of RAS cases, most commonly affecting the proximal third and ostium of the main renal artery [1].

The reported prevalence of RAS among patients undergoing coronary artery bypass grafting (CABG) varies widely across studies, ranging from 4.5% to 47%, depending on population characteristics and diagnostic methodology [3-6]. For example, an Iranian study reported a prevalence of 17% [3], Egyptian studies reported 4.5-13% [4,5], and a Chinese study reported 47.6% [6]. Although associations with risk factors such as

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hypertension and diabetes are well documented, data from Middle Eastern countries, particularly Syria, where healthcare infrastructure has been affected by ongoing conflict, remain limited, hindering the development of region-specific recommendations [7,8]. The prevalence of atherosclerotic RAS increases with advancing age, male sex, and traditional cardiovascular risk factors, including hypertension, diabetes mellitus, smoking, dyslipidemia, aortoiliac disease, and isolated systolic hypertension [7]. Nevertheless, its true prevalence in unselected populations remains uncertain [8].

Atherosclerotic RAS is a progressive condition: more than half of affected patients experience worsening stenosis within five years of diagnosis, and approximately 20% progress to critical stenosis with renal atrophy and chronic kidney disease [9]. Both unilateral and bilateral RAS may precipitate renal function decline perioperatively or after initiation of renin–angiotensin system inhibitors (e.g., angiotensin-converting enzyme inhibitors or angiotensin receptor blockers), thereby increasing morbidity and mortality [2].

This study aimed to determine the prevalence of RAS in high-risk patients referred for CABG in a Syrian cohort, to evaluate the impact of demographic and cardiovascular risk factors on its occurrence, and to explore the potential benefits of early detection of asymptomatic RAS for optimizing management and improving survival—addressing a critical gap in regional data.

Methods

This study was conducted at Damascus University Hospitals between May 2017 and May 2018. A total of 1,000 patients undergoing coronary angiography were evaluated. Of these, 765 patients had normal or non-significant coronary stenosis and were considered suitable for percutaneous coronary intervention, while 235 patients were deemed candidates for coronary artery bypass grafting (CABG). Eligibility for CABG was based on established criteria, including ≥50% left main coronary artery stenosis, severe three-vessel disease with left ventricular ejection fraction (LVEF) <50%, or equivalent findings such as ≥70% stenosis in both the left anterior descending (LAD) and left circumflex (LCX) arteries. Patients with two-vessel disease involving the proximal LAD and either reduced LVEF (<50%) or documented ischemia on noninvasive imaging were also included, in accordance with ACC/AHA clinical practice guidelines. Recruitment occurred during admission for cardiac catheterization, with final eligibility confirmed after coronary angiography Figure 1.

Thirty-five patients were excluded based on predefined criteria: severe heart failure (LVEF <40%), significant arrhythmias, psychiatric disorders, severe comorbidities, bleeding diatheses, acute coronary syndrome requiring primary percutaneous coronary intervention, or serum creatinine ≥1.5 mg/dL.

Upon admission, a detailed clinical history was obtained, with emphasis on traditional cardiovascular risk factors. Hypertension was defined as blood pressure ≥140/90 mmHg or use of antihypertensive therapy; diabetes mellitus as fasting glucose ≥126 mg/dL or treatment with antidiabetic medications; smoking status as current or former use; and dyslipidemia as abnormal lipid profile or lipid-lowering therapy. All patients underwent physical examination, electrocardiography, echocardiography, and routine laboratory testing before the procedure.

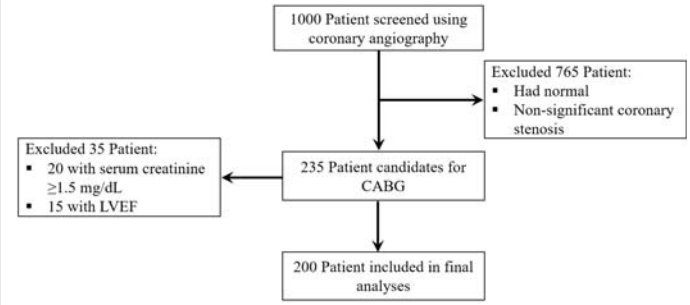

Figure 1: Illustrates the study flow diagram of patient selection and cohort formation.

Following completion of coronary angiography, eligible patients underwent selective renal angiography during the same session. A Judkins Right 4 (JR4) catheter, typically used for right coronary artery angiography, was advanced by pullback to the level of the renal artery origin. If selective cannulation was unsuccessful, nonselective renal angiography was performed using a pigtail catheter positioned at the level of the renal artery origins. Procedures were performed via femoral access using iohexol contrast and fluoroscopy in the LAO 20 projection. Angiographic images were reviewed independently by two cardiologists. Significant renal artery stenosis (RAS) was defined as ≥50% luminal narrowing in one or both renal arteries or their branches. Normal renal arteries were defined as smooth, regular, and free of atheroma, while non-significant stenosis was defined as luminal stenosis <50%.

Data were analyzed using SPSS version 23. Normality was assessed using the Kolmogorov–Smirnov test, and homogeneity of variances using Levene's test. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Student's t-test was used for comparisons of quantitative variables, the chi-square test for categorical variables, and one-way ANOVA for comparisons across multiple groups. Pearson's correlation coefficient was applied to continuous variables. Multivariate logistic regression analysis was performed to identify independent predictors of RAS, including variables with $p < 0.1$ in univariate analysis. Statistical significance was defined as $p \leq 0.05$ with a 95% confidence interval.

Results

A total of 235 patients were screened during the study period, of whom 200 met the inclusion criteria after excluding 35 patients (20 with serum creatinine ≥1.5 mg/dL, 15 with LVEF.

The mean age of the cohort was 62.8 ± 9.0 years (range, 40–81). Age was not significantly associated with the presence of RAS ($p = 0.373$). The study population consisted of 154 males (77%) and 46 females (23%). Female sex was significantly

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associated with RAS (p = 0.004), with prevalence rates of 34.8% among females compared with 15.6% among males, as shown in Table 1.

Hypertension was present in 56% of patients and demonstrated a significant association with RAS (p = 0.001). Diabetes mellitus was observed in 52% of the cohort and was also significantly associated with RAS (p = 0.011). Although smoking was reported in 60% of patients, non-smokers exhibited a higher prevalence of RAS (p = 0.004), a finding likely influenced by the higher smoking rates among males, as shown in Table 2.

Left main coronary artery stenosis was identified in 14% of patients and showed a significant correlation with RAS (p = 0.025) Renal angiography findings were classified into five categories as shown in Table 3.

Table 1: Baseline Characteristics and association with RAS.

Characteristic	Total (n = 200)	RAS (n = 40)	No RAS (n = 160)	p - value
Age (mean ± SD)	62.8 ± 9.0	64.1 ± 8.5	62.4 ± 9.2	0.373
Female, n (%)	46 (23%)	16 (40%)	30 (18.8%)	0.004
Hypertension, n (%)	112 (56%)	32 (80%)	80 (50%)	0.001
Diabetes, n (%)	104 (52%)	28 (70%)	76 (47.5%)	0.011
Smoking, n (%)	120 (60%)	16 (40%)	104 (65%)	0.004
Dyslipidemia, n (%)	20 (10%)	6 (15%)	14 (8.8%)	0.239
Peripheral vascular disease, n (%)	11 (5.5%)	3 (7.5%)	8 (5%)	0.535
Family history of coronary artery disease, n (%)	40 (20%)	10 (25%)	30 (18.8%)	0.377
Prior cerebrovascular accident, n (%)	2 (1%)	1 (2.5%)	1 (0.6%)	0.477
Left ventricle ejection fraction <50%, n (%)	18 (9%)	4 (10%)	14 (8.8%)	0.805
Left Main Stenosis, n (%)	28 (14%)	10 (25%)	18 (11.3%)	0.025

Table 2: Multivariate Logistic Regression for Predictors of RAS.

Variable	Odds Ratio (95% CI)	p-value
Female Sex	2.8 (1.2-6.5)	0.018
Hypertension	3.5 (1.4-8.7)	0.007
Diabetes	2.4 (1.1-5.3)	0.029
Left Main Stenosis	2.6 (1.0-6.8)	0.049
Smoking (non vs. yes)	0.5 (0.2-1.2)	0.115

Note: Adjusted for age and other univariate factors.

Table 3: Renal Angiographic Findings.

Finding	n (%)
Normal	102 (51%)
Nonsignificant Changes	58 (29%)
Significant Right RAS	6 (3%)
Significant Left RAS	20 (10%)
Bilateral Significant RAS	14 (7%)
Lesion Location: Main Artery	63%
Ostium	26%
Branch Vessels	11%

No renal artery aneurysms were identified.

No significant associations were observed with peripheral vascular disease (5.5%, p = 0.535), dyslipidemia (10%, p = 0.239), family history of premature coronary artery disease (20%, p = 0.377), prior cerebrovascular accident (1%, p = 0.477), reduced LVEF (9%, p = 0.805), or the total number of cardiovascular risk factors (p = 0.417)

Discussion

In this study, the prevalence of renal artery stenosis (RAS) among patients referred for coronary artery bypass grafting (CABG) was 20%. This rate is comparable to regional findings, including an Iranian study reporting 17% [3] and Egyptian studies reporting 4.5% to 13% [4,5]. However, it is considerably lower than the 47.6% prevalence reported in a Chinese cohort [6]. Such discrepancies may reflect differences in hypertension prevalence (56% in our cohort *vs.* variable rates elsewhere), ethnic background (Middle Eastern vs. Asian populations), and methodological variations, particularly the use of catheter-based angiography in our study compared with noninvasive imaging in others [10]. Our results align partially with Liang, et al. (2012), who reported associations with age and myocardial infarction but not diabetes, whereas diabetes (OR 2.4) and hypertension (OR 3.5) were strong predictors in our cohort [6].

Unlike previous studies demonstrating a strong association between RAS and advancing age [11], no significant age-related trend was observed in our cohort (p = 0.373). This may be due to the relatively advanced mean age (62.8 years) and limited age variability. The significant association between RAS and left main coronary artery stenosis (p = 0.025) may indicate shared anatomical and pathophysiological susceptibilities, as both vessels originate directly from the aorta [12]. Compared with Khatami et al. [3], our findings regarding female sex are consistent, whereas the lack of association with age may reflect regional demographic differences.

No significant associations were found with peripheral vascular disease, dyslipidemia, family history of premature coronary artery disease, prior cerebrovascular events, or reduced left ventricular ejection fraction. These negative findings may be attributable to the low prevalence of these conditions in our cohort or the influence of unmeasured confounders [13].

Comparisons with similar studies reveal substantial heterogeneity, likely driven by ethnic, demographic, and methodological differences. Our prevalence (20%) exceeds that reported in Egyptian cohorts [4,5] but remains lower than Chinese data [6], underscoring the need for region-specific evidence in Syria.

This study has several limitations. The modest sample size (n = 200) and single-center design may limit generalizability. The data were collected in 2017–2018, prior to recent advances in noninvasive imaging, which is acknowledged as a limitation. Reliance on catheter-based angiography without functional assessment may have underestimated hemodynamically

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insignificant lesions. Additionally, the absence of post-CABG follows-up precludes assessment of the prognostic impact of RAS. Although multivariate analysis was not initially planned, it was subsequently incorporated to strengthen the evaluation of comorbidities.

Despite these limitations, our findings highlight the clinical relevance of RAS in CABG candidates, particularly among patients with hypertension, diabetes mellitus, and left main coronary artery disease. Early identification of asymptomatic RAS may aid in optimizing perioperative management and long-term outcomes. Future multicenter studies with larger cohorts, incorporating noninvasive imaging modalities such as color Doppler ultrasonography and longitudinal follow-up, are needed to clarify the prognostic significance of RAS in this high-risk population.

Conclusion

In this study, the prevalence of renal artery stenosis (RAS) among patients referred for coronary artery bypass grafting (CABG) was 20%, with higher rates observed among individuals with hypertension, diabetes mellitus, female sex, and left main coronary artery stenosis. These findings support consideration of routine RAS screening in high-risk cardiovascular patients, particularly females with hypertension and diabetes, to optimize clinical management and potentially improve outcomes. Larger multicenter studies incorporating advanced imaging modalities and contemporary data are warranted to refine clinical guidelines and better define the prognostic significance of RAS in this population.

Data availability

All data is available with the author with a reasonable request.

Ethical approval

Ethical approval was obtained from the Institutional Review Board of Damascus University. Written informed consent was obtained from all participants.

References

1. Safian RD, Textor SC. Renal-artery stenosis. N Engl J Med. 2001;344:431–442. Available from: https://doi.org/10.1056/nejm200102083440607
2. Kern MJ, Sorajja P, Lim MJ. Cardiac Catheterization Handbook [e-book]. Philadelphia: Elsevier Health Sciences; 2015.
3. Khatami MR, Edalati-Fard M, Sadeghian S, Salari-Far M, Bs MP. Renal artery stenosis in patients with established coronary artery disease: prevalence and predicting factors. Saudi J Kidney Dis Transpl. 2014;25(5):986–991. Available from: https://doi.org/10.4103/1319-2442.139880
4. Elkersh AA, Samir A, Reda A. The risk factor profile in Egyptian patients with acute coronary syndrome: an observational study. Menoufia Med J. 2022;35(2):Article 6. Available from: https://www.sciencepublishinggroup.com/article/10.11648/j.ccr.20220604.12
5. The incidence and predictors of renal artery stenosis in patients suspected with coronary artery disease referred for coronary angiography. Egypt Journal of Hospital Medicine. 2019;74(4):797–801. Available from: https://doi.org/10.21608/ejhm.2019.24357
6. Liang F, Hu DY, Wu MY, Li TC, Tang CZ, Wang JY, Lu CL. The incidence of renal artery stenosis in the patients referred for coronary artery bypass grafting. Indian Journal of Nephrology. 2012;22(1):13–17. Available from: https://doi.org/10.4103/0971-4065.91181
7. Al-Thani W, Al-Mansouri M. Increasing prevalence of atherosclerosis in the renal artery with advancing age, male gender, and traditional cardiovascular risk factors: hypertension, diabetes, smoking, dyslipidemia, and isolated aortoiliac disease. Saudi J Kidney Dis Transpl. 2025;36(5):789–95.
8. Weber BR, Dieter RS. Renal artery stenosis: epidemiology and treatment. Int J Nephrol Renovasc Dis. 2014;7:169–181. Available from: https://doi.org/10.2147/IJNRD.S40175
9. Aboyans V, Ricco JB, Bartelink MLE, Björck M, Brodmann M, Cohnert T, et al. 2017 ESC guidelines on the diagnosis and treatment of peripheral arterial diseases: atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteries. Eur Heart J. 2017;39(9):763–816. Available from: https://doi.org/10.1093/eurheartj/ehx095
10. Ash J, Smith M, Johnson BL. Renal artery stenosis in patients undergoing coronary artery bypass grafting: a systematic review and meta-analysis. Eur J Vasc Endovasc Surg. 2010;40(3):353–366.
11. Colbert GB, Abra G, Focal E. Update and review of renal artery stenosis. Dis Mon. 2020;66(11):Article 101118. Available from: https://doi.org/10.1016/j.disamonth.2020.101118
12. Shafique S, Peixoto AJ. Renal artery stenosis and cardiovascular risk. J Clin Hypertens (Greenwich). 2007;9(3):201–8. Available from: https://doi.org/10.1111/j.1524-6175.2007.06113.x
13. Clinical predictors of atherosclerotic renal artery stenosis: a prospective study of 1,000 patients undergoing coronary angiography. Nephrol Dial Transplant. 2009;24(7):2143–2149.

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