

## Prevalence, risk factors and association of renal artery stenosis with coronary artery disease in patients undergoing coronary angiography in Ibn-Al Bitar center for cardiac surgery

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### Abstract:

**Background:**-Atherosclerosis is a systemic disease that often affects multiple vascular distributions in a single patient. The increased prevalence of renal artery stenosis in association with coronary artery disease has been well documented.

**Objectives:**-To examine in detail the prevalence of renal artery stenosis in patients undergoing cardiac catheterization for suspected coronary artery disease.

**Patients & methods:**-Between April 2010 and February 2011, two hundred patients underwent coronary and renal angiography at the same session in Ibn Al-bitar Hospital for Cardiac Surgery. Clinical and procedural data for patients undergoing renal angiography were prospectively collected and entered into database specially designed for the present study.

**Results:**-Two hundred patients were included in this study, 133 (66.5%) were males and a mean age of 53±12 years, age range (42-73 year). Significant renal artery stenosis (≥ 50% luminal narrowing) was identified in 18 patients (9%) made up the renal artery stenosis group. Age, hypertension, diabetes mellitus and renal impairment were significantly associated risk factors for renal artery stenosis. Gender, smoking and hyperlipidemia were not significantly associated with either group. The frequency of renal artery stenosis is significantly increased with the number of stenotic coronary segments; patient with two and three vessel disease had more frequent renal artery stenosis than the others.

**Conclusion:**-Renal artery stenosis is prevalent in a significant proportion of patients undergoing cardiac catheterization for suspected coronary artery disease & the number of coronary arteries with stenotic lesions is a remarkable predictor of significant renal artery stenosis.

**Key words:** Renal artery stenosis ,coronary atherosclerosis, renal angiography

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### Introduction:

Atherosclerosis is a systemic disease that often affects multiple vascular distributions in a single patient. (1).The increased prevalence of renal artery stenosis (RAS) in association with coronary disease and lower extremity arterial disease has been well documented (2-7). What may be less well understood by cardiovascular specialists caring for patients with atherosclerotic coronary artery disease(CAD), is that the presence of asymptomatic RAS may have serious prognostic consequences including an association with progressive loss of renal function and even dialysis (8,9). Progression or worsening of atherosclerotic renal artery stenosis (ARAS) occurs in about 10% of patients with hemodynamically significant RAS regardless of medical therapy to control hypertension, and renal artery occlusion leads to irreversible loss of renal excretory function (9-11). Different estimations

of RAS prevalence can be found, depending on the age And characteristics of population studied, concomitant risk factors and social and environmental determinants (12-15). The prevalence of RAS in the general population is not known, but it is estimated to range from 5 to 10% (16) in hypertensive subjects and 17% in patients with type 2 diabetes mellitus (DM) and coexistent hypertension (HT) (17). The prevalence of RAS was found to be in the range of 22– 44% in patients referred for evaluation of peripheral vascular disease or abdominal aortic disease (18), and may be even higher in patients with impaired renal function and coexistent atherosclerotic vascular disease in other arterial territories (19). RAS may account for 7% of all end stage renal disease (ESRD), and up to 20% of cases in white patients 50 years of age or older (20) .The prevalence of RAS in patients undergoing routine cardiac catheterization has been estimated to be in the range of 11to 23% (21 ,22). Recently, in a cohort of 3987 patients undergoing abdominal aortography immediately following coronary angiography, the

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presence of significant RAS was a strong independent predictor of mortality (23). The more severe the stenosis, the higher the mortality risk. The presence of bilateral ARAS significantly reduced 4-year survival in affected patients to 47% compared with 59% ( $P = 0.001$ ) in patients with unilateral ARAS (24). The incidence of this disorder markedly rises in patients with acute (even if superimposed upon a preexisting elevation in blood pressure), severe, or refractory hypertension (25, 27). Approximately 50% of patients with renovascular hypertension have an abdominal or flank bruit, and the bruit is more likely to be hemodynamically significant if it lateralizes or extends throughout systole into diastole (28). In addition to an acute rate of onset and severity, there are several other findings that suggest that there is a moderate to severe risk that renovascular disease is responsible for the hypertension. Like Onset of HT before the age of 30 years and Refractory or resistant hypertension (29-34). The gold standard for diagnosing renal artery stenosis is renal arteriography. False negative tests (low sensitivity) are the major concern with all non-invasive tests, since patients with a potentially correctable cause of hypertension will be missed (32, 33). The following noninvasive tests are reasonable alternatives for screening for renal artery stenosis. Magnetic resonance angiography, Computed tomographic angiography and Duplex Doppler ultrasonography, (35). A decision concerning vascular repair versus medical therapy and the type of repair procedure should be individualized for each patient. Current endovascular therapies for RAS achieve high procedural success rates with excellent long-term patency rates, preservation of renal function, and more manageable hypertension (36-40).

#### Aims of the study:

To estimate the prevalence of RAS among CVD patients undergoing cardiac catheterization, and to identify covariates associated with RAS among CVD patients

#### Patients and Methods:

Between April 2010 and February 2011, two hundred patients underwent coronary and renal angiography at the same session in Ibn Al- bitar teaching Hospital for Cardiac Surgery in Baghdad were included. Clinical and procedural data for patients undergoing renal angiography were collected. Patients informed consent to undergo both coronary and renal angiography. Inclusion Criteria: All patients submitted for diagnostic coronary angiography, underwent renal angiography regardless the presence or absence of CAD. Exclusion Criteria: 1. Serum creatinine  $\geq 2$  mg/dl. 2. Increased left ventricular end diastolic pressure. 3. Excessive use of contrast dye during the diagnostic procedure, more than 5 ml per body weight (kg)/ serum creatinine (41). Coronary angiography was performed via femoral

approach. In this study; coronary artery stenosis  $\geq 50\%$  was considered to be significant (42). Selective renal angiography was done and employing a Judkins right coronary catheter with hand injection of 4 to 8 ml of contrast agent in each main renal artery, and with supplementary semi selective injections if there was suspicion of ostial renal artery stenosis. Renal angiography was performed in the anterior– posterior projection with Iohexol (Omnipaque) 300 to a total volume not more than 25 ml. The injection was recorded with cine film at 30 frames per second. By using quantitative coronary angiography, an angiographic ally significant RAS was defined by a narrowing of the lumen  $\geq 50\%$ , a high grade RAS was defined as a narrowing  $\geq 70\%$  (43).

#### Definitions:

1. Hypertension was defined as systolic blood pressure  $\geq 140$  mm Hg or diastolic blood pressure  $\geq 90$  mm Hg (44) with or without antihypertensive treatment. We obtained noninvasive BP readings, before catheterization and after at least 5 min of rest.
2. Hypercholesterolemia was defined as cholesterol levels  $\geq 240$  mg/dl (45).
3. Patients were considered to be diabetic; according to American Diabetes Association, 2007, fasting blood glucose  $\geq 7.0$  mmol/L (126 mg/dl) or random blood glucose  $\geq 11.1$  mmol/L (200 mg/dL) with symptoms (28).
4. The patients were considered smokers if they were current smokers or had quit smoking less than two years before (46, 47).
5. The glomerular filtration rate (GFR) was estimated from the plasma creatinine concentration (PCr), gender, age, and body weight of the patient, (49).

#### Statistical analysis:

Data were analyzed using the computer software facilities of SPSS-17 (Statistical packages for social sciences-version 17). Data were presented as mean, standard deviation, number and percentage. Chi-square test (for comparing the significance of difference for the qualitative data) and t-test (for comparing the significance of difference for the quantitative data) were used to test significance of difference at ( $p$  value  $< 0.05$ )

#### Results:

Two hundred patients were included in this study, 133 (66.5%) were male and 67 (33.5%) were female, with a mean age of  $53 \pm 12$  years. The baseline clinical characteristics are summarized in table (1)

**Table -1- Distribution of patients according to gender and risk factors**

Clinical character	NO RAS (No,%)	RAS(No,%)	Total	P value
Number	182	18	200	
Age (NO+-SD)	52±10	65±8	53±12	0.0001*
Female	59	8	67(33,5%)	0.302
Male	123	10	133(66.5%)	0.302
Hypertension	75(41.2%)	15(83.3%)	90(45%)	0.0006*
Diabetes mellitus	54(29.7%)	14(77.8%)	68(34%)	0.0001*
Renal insufficiency*	8(4.4%)	4(22.2%)	12(6%)	0.002*
Smoking	53(29.12%)	5(27.8%)	58(29%)	0.905
Hyperlipidemia	103(56.6%)	12(66.7%)	115(57%)	0.410

•significant P value \*Renal insufficiency; increase in GFR

Significant renal artery stenosis (RAS) (>50% luminal narrowing) was identified in 18 patients (9%) who made up the RAS group as shown in table (1). Patients with significant RAS were older (65+-8 vs 52+-10)Hypertension was more frequent in RAS group (83.3 vs 41.2%)Diabetes mellitus was more frequent in RAS group (77.8 vs 29.7%).Glomerular filtration rate

was lower in the RAS group ,so patient with RAS have renal insufficiency more than no RAS (22.2 vs 4.4%) Gender, smoking and hyperlipidemia were not significantly associated with either group as shown in table (1) The frequent of RAS is significantly increased with the number of stenotic coronary segments, Patient with two and three vessels disease have more RAS than other as shown in table (2)

**Table -2- Distribution of the coronary arteries stenosis in related to presence of renal artery stenosis**

	NO RAS(No.%)	RAS (No.%)	Total	P value
No significant coronary artery stenosis	42 (97.7%)	1(2.3%)	43	
Single vessel disease	71 (98,6%)	1(1.4%)	72	
Two vessel disease	30 (83.3%)	6(16.7%)	36*	<0.0001
Three vessel disease	39 (79.6%)	10(20.4%)	49*	<0.0001

\*highly significant difference in proportions using, 0.05 level of significance p=0.0001 No; number

### Discussion:

Renal artery stenosis worsens the course of coronary artery disease, leading at the same time to more frequent episodes of myocardial infarction, coronary revascularization and, worst of all, to increased mortality (23,24). In recent years, a growing number of patients referred for coronary angiography and revascularization have advanced hypertension and renal failure due to RAS. Therefore, identification of patients at high risk of RAS could be of great clinical relevance and affect therapeutic decisions (9). In this study of two hundred patients undergoing cardiac Catheterization, the prevalence of significant RAS was 9%, this result was comparable with Leandri et al. (50) study, which found that the prevalence was also about 9%, indicating that present studied group was similar to Leandri et al study group with respect to the age and distribution of risk factors. In comparison to other studies which was conducted by Harding et al. (21) and Vetrovecn et al. (22), the prevalence of RAS in patients undergoing routine cardiac catheterization has been estimated to be in the range of 11to 23%, this difference in prevalence may be related to the characteristics of populations studied (older, more hypertensive and more diabetic in their studies). Significantly associated risk factors for RAS in this study were age, hypertension, diabetes mellitus and renal impairment .This result was similar to other studies that were conducted by D. Weber- et al. (4), Tadeusz et al. (51) and Mauricio et al. (52). Gender

in this study was not a significantly associated with RAS, this result was similar to other studies done by D. Weber- et al (4), but Tadeusz et al. (51) showed that there was male predominance and Mauricio Cohen et al. (52) showed there was female predominance. Smoking and hyperlipidemia were not significantly associated with RAS in this study as similar result to other studies (4, 52). Current study; revealed that there was significant association between the severity of coronary artery disease and RAS, as documented by coronary and renal angiography; this is a similar finding in other studies (2-7). This reasoning is used to justify screening renal angiography in patients at increased risk for RAS who are undergoing coronary angiography. In study done by Babak payami et al .hypertensive patients who were suspected for CAD and underwent simultaneous coronary and renal artery angiography and found that the prevalence of RAS in this population was 18.2% which was nearly high .14.99% of the study population had unilateral RAS while 3.24% of them suffered from bilateral RAS (53) Two hundred renal angiography were done easily and safely in our center, it is mentioned that renal angiography at the time of cardiac catheterization can be done with no additional risk (54). Angiography should not take the place of appropriate non-invasive study to screen and evaluate patients for RAS. However, there will be instances when non-invasive tests have not been performed and a patient who would benefit from evaluation of renal

artery anatomy is undergoing either coronary or peripheral arterial angiography. In addition, many non-invasive tests evaluating RAS have either low sensitivity or relatively high false positive rates (32, 33). The question arises, whether or not the diagnosis of significant RAS is of any value for patient management. In the majority of patients with arterial hypertension refractory to medical therapy or in those with renal insufficiency likely to be attributed to significant RAS, intervention (e.g. percutaneous balloon angioplasty (PTRA) with or without stenting) will be offered to the patient (55). Recurrent flash pulmonary edema in the presence of significant RAS constitutes another widely accepted indication for doing renal angiography and possible intervention (56), however there is general agreement that the presence of significant RAS in the absence of a clinical correlate should not result in an intervention, since the natural history of asymptomatic RAS may be favorable in many patients. It is considered that this group of patients should be enrolled in a follow-up program with a high clinical index of suspicion to possible consequences of RAS. The blood pressure and the evolution of renal function and renal size over time deserve special attention. Initiation and intensification of drugs blocking components of the renin-angiotensin system should be conducted in a particularly careful way to avoid renal side effects. Renin-angiotensin inhibitors discontinuation of the offending agent can frequently reverse acute impairment in renal function (57). medical therapy is the cornerstone for management of RAS; however, numerous trials have compared medical therapy with revascularization (58). There is no difference between two approaches on reduction of blood pressure and improving renal function for patients with moderate RAS. Ageing and cardiovascular risk factors were closely associated with significant RAS and hence could be used in effectively predicting the presence of RAS in patients undergoing routine coronary and/or peripheral angiography (59)

### Conclusions

Renal artery stenosis is prevalent in a significant proportion of patients undergoing cardiac catheterization for suspected coronary artery disease. The presence of two and three vessel disease is a powerful predictor of significant renal artery stenosis.

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### Author contributions:

**Dr .Ghazi Haji and Dr. Ghassan Mahmood** are responsible for collecting clinical and laboratory data

**Dr. Khalil Sarhan Khalaf and Dr. Muthanna Al-Quraishi** are responsible for coronary angiography and renal angiography

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ملاحظة: يمكن الرجوع للباحث لغرض الاطلاع على المصادر المتبقية