Comparison of Left Main Coronary Disease Prevalance in Patients with or without Chronic Kidney Disease: A Propensity Score Match Analysis

Sol Ana Koroner Hastalığı Prevalansının Kronik Böbrek Yetersizliği Olan ve Olmayan Hastalarda Karşılaştırılması: Eğilim Skor Eşleştirme Analizi

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ABSTRACT

Objective: In our study we sought to determine the prevalence of critical left main coronary artery (LMCA) disease in chronic kidney disease (CKD) and to compare it with the prevalence in patients with normal kidney function.

Material and Methods: 502 consecutive patients with stable angina pectoris who underwent coronary angiography were screened. 423 patients were included in the final analysis. Prevalence of LMCA disease was compared between patients with or without CKD. 102 patients with CKD were matched with 102 patients without CKD using propensity score matching and the prevalence of LMCA disease was compared between these groups.

Results: Mean age was 61.08±10.23. Male gender and diabetes were significantly higher whereas smoking was significantly lower in patients with CKD. Mean Gensini score was higher in patients with CKD (58.66±33.77 vs. 57.62±28.69, p:0.002). Presence of any lesion or significant stenosis in LMCA did not differ between the groups. 102 patients with CKD matched with 102 patients with normal kidney function after 1:1 propensity score analysis. Prevalence of critical LMCA disease did not differ between matched CKD and non CKD groups (21% vs 17.6% respectively, p: 0.481).

Conclusion: In patients with CKD, the prevalence of a critical LMCA lesion was not different from the patients with normal kidney function. The similarity of the prevalence persisted after propensity score matching.

Key Words: Left main coronary disease, Chronic kidney disease, Propensity score match analysis

ÖZ

Amaç: Bu çalışmada kronik böbrek hastalığına (KBH) sahip hastalarda sol ana koroner (LMCA) hastalığının prevalansını ve bu prevalansın normal böbrek fonksiyonuna sahip hastalardan farklı olup olmadığını saptamayı amaçladık.

Gereç ve Yöntemler: Koroner anjiyografi uygulanmış 502 ardışık stabil koroner arter hastası tarandı. 423 hasta son değerlendirmeye dahil edildi. LMCA hastalığının prevalansı KBH olan veya olmayan hasta gruplarında karşılaştırıldı. Eğilim skor analizi yöntemi ile 102 kronik böbrek yetersizliği hastası 102 normal böbrek fonksiyonuna sahip hasta ile eşleştirildi ve LMCA hastalığının sıklığı bu iki grupta karşılaştırıldı.

Bulgular: Ortanca yaş 61,08±10,23 idi. KBH grubunda erkek cinsiyet ve diyabet anlamlı olarak daha fazla, sigara kullanımı ise anlamlı olarak daha azdı. Ortalama Gensini skoru KBH grubunda anlamlı olarak daha fazlaydı (58,66±33,77 vs. 57,62±28,69, p:0,002). LMCA'da herhangi bir lezyon veya kritik lezyon varlığı iki grupta benzerdi. Birebir eğilim skor analizi yöntemi ile 102 KBH hastası 102 normal böbrek fonksiyonuna sahip hasta ile eşleştirildi. LMCA hastalığı sıklığı bu iki grupta yine benzer bulundu (sırasıyla %21 vs %17,6, p:0,481).

Sonuç: KBH'ye sahip hastalarda kritik LMCA hastalık prevalansı normal böbrek fonksiyonuna sahip hastalardakinden farklı değildir. Bu benzerlik eğilim skor analizi sonrası da değişmemiştir.

Anahtar Sözcükler: Sol ana koroner hastalığı, Kronik böbrek hastalığı, Eğilim skor eşleştirme analizi

INTRODUCTION

Chronic kidney disease (CKD) constitutes a global health problem. Prevalence of CKD is 13.4% worldwide (1) and it is known to be associated with diabetes (DM), hypertension (HTN) and higher body mass index (BMI) (2). Chronic kidney disease is also independently associated with cardiovascular disease (3) which is the most common cause of death in patients with estimated glomerular filtration rate (eGFR) below 60 ml/min/1.73 m² (4). In addition to atherosclerosis, arteriosclerosis and vascular calcification are important pathological processes that warrants a different perspective for understanding and managing coronary heart disease in chronic kidney patients (5).

Left main coronary artery disease (LMCA) is a distinct clinical entity in the spectrum of cardiovascular diseases because of its relatively high mortality and complex management. Especially in chronic kidney disease, the appropriate decision for treatment strategy of LMCA (percutaneous or surgical intervention) is still not clear (6).

Whether the risk of having LMCA is increased or not has not been definitely clarified in the setting of chronic kidney disease. In our study, we sought to determine the prevalence of LMCA in chronic kidney disease and to establish the association between these two challenging diseases.

MATERIALS and METHODS

Study population

502 consecutive patients with stable angina pectoris that underwent coronary angiography between January 2013 and December 2014 at a single center were retrospectively screened. 42 patients were excluded due to previous coronary artery bypass surgery (CABG) and 37 patients were excluded due to unavailable laboratory data. 423 patients were included in the final analysis.

Demographical and clinical data

Age, gender and cardiovascular risk factors were obtained from patient files and hospital records. Cardiovascular risk factors were defined as hypertension, diabetes, dyslipidemia, and active cigarette smoking. Hypertension was defined as patients on antihypertensive medication, diabetes was defined as patients on anti hyperglycemic medication or patients with hemoglobin A1C levels over 6.5% and dyslipidemia was defined as patients on statin treatment or patients with low density lipoprotein levels over 100 mg/dl on admission.

Coronary angiography and extent of coronary artery disease

Coronary angiograms were performed using the Philips Allura Xper FD10 X-ray system (Philips, NL). Results were evaluated and reported by the physicians who performed the procedure and did not participate in the study. Results of the coronary angiograms were obtained from the final procedure report.

Stenoses greater than 50% in any coronary artery were considered significant. The presence of any atherosclerotic lesion in the left main coronary artery was also noted. LMCA disease was defined as >50% stenosis in a non bypassed left main coronary artery with or without involvement of other coronary arteries. One vessel disease was defined as any stenosis greater than 50% only in one coronary artery other than LMCA. Two vessel disease was defined as stenoses greater than 50% in any two coronary arteries. Three vessel disease was defined as > 50% stenosis in all three main vessels other than LMCA.

Extent of coronary artery disease was calculated by using the Gensini score (7). The lesions in each coronary segment was graded from 1 to 32 (0-25% was 1, 26-50% was 2, 51-75% was 4, 76-90% was 8, 91-99% was 16 and 100% was 32). Each grade was then multiplied by the coefficient of that specific segment.

Laboratory data and definition of chronic kidney disease

Serum creatinine levels of the participants on admission were obtained from hospital records. Biochemical analyses were done using the Cobas Integra 400 analyzer (Roche Diagnostics, CH). If the creatinine level was not checked on admission, the latest value in the 14 days before admission was included in the analysis. Chronic kidney disease (CKD) was defined as eGFR below 60 ml/min/1.73 m². End stage renal disease (ESRD) was defined as eGFR below 15 ml/min/1.73 m². eGFR was calculated using the Modification of Diet in Renal Disease (MDRD) equation (8).

End points

The main end point was to determine the prevalence of critical LMCA disease in patients with and without chronic kidney disease and to establish any difference regarding LMCA disease between these two groups.

Statistical analysis

All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) statistical analysis program version 21.0 (IBM corporation, USA). Continuous variables were expressed as mean ± standard deviation (SD). Categorical variables were compared using Chi square test and continuous variables were compared using independent samples t test. Correlation analysis were done by Spearman's rank order correlation. Binary logistic regression analysis was done to determine parameters affecting the presence of LMCA disease.

Due to non randomized nature of the study population, propensity score (PS) matching was used. PS matched subjects with or without chronic kidney disease were compared according to prevalence of LMCA. The PS model included the cardiovascular risk factors (age, gender, diabetes, hypertension and dyslipidemia) and the Gensini score. PS matching was performed by using a caliper of 0.20 SDs of the logit of the PS. After PS matching, baseline variables were compared using the chi square test (for categorical variables) and independent samples t test (for continuous variables)

RESULTS

The flow chart of the study is depicted in Figure 1. Mean age was 61.08±10.23, 320 patients (75.7%) were male. The vast majority of patients had hypertension (82.7%). Mean Gensini score was 67.24 ± 36.04. 94 patients (22.2%) had a critical lesion in left main coronary artery. 136 patients (32.9%) had three vessel disease. Baseline characteristics of the study population were outlined in Table I.

102 patients (24.1%) had eGFR below 60 ml/min/1.73 m². Male gender and diabetes were significantly higher whereas smoking was significantly lower in patients with chronic kidney disease (p values were 0.03, 0.02 and <0.01; respectively). Mean Gensini scores were similar and the presence of any lesion or significant stenosis in the LMCA did not differ between groups. There was no significant correlation between the Gensini score and eGFR. Baseline characteristics in patients with or without CKD were shown in Table II.

Table I: Baseline characteristics of the study population.

Demographics	
Age	61.08±10.23
Gender – male (n %)	320 (75.7)
Risk factors (n %)	
HTN	350 (82.7)
DM	194 (45.9)
DL	194 (45.9)
Smoking	196 (46.3)
CKD	102 (24.1)
ESRD	49 (11.6)
Laboratory findings	
Creatinine (mg/dl)	1.64±2.00
eGFR (ml/min/1.73 m²)	74.10±32.02
Angiographical features	
Gensini score	67.24±36.04
Any LMCA lesion (n %)	135 (31.9)
Critical LMCA lesion (n %)	94 (22.2)
3VD (n %)	136 (32.2)
Critical LMCA+3VD (n %)	63 (14.9)

(**3VD:** three vessel disease; **CKD:** chronic kidney disease; **DL:** dyslipidemia; **DM:** diabetes; **eGFR:** estimated glomerular filtration rate; **ESRD:** end stage renal disease; **HTN:** hypertension; **LMCA:** left main coronary artery).

Logistic regression analysis was performed to determine parameters affecting the presence of a critical LMCA lesion. Model 1 included age, diabetes, hypertension, dyslipidemia, smoking and model 2 included variables in model 1 plus eGFR and the presence of chronic kidney disease. Only age independently predicted the presence of critical LMCA disease. (HR:1.056, p:<0.001)

102 patients with CKD matched with 102 patients with normal kidney function after 1:1 propensity score analysis. Baseline characteristics of matched groups were outlined in Table III.

Prevalence of critical LMCA disease did not differ between matched CKD and non CKD groups (21% vs. 17.6% respectively, p: 0.481). Also the presence of any LMCA lesion did not differ between matched groups (30.4% vs. 32.4% respectively, p:0.535).

DISCUSSION

In this study we retrospectively examined 423 patients with stable coronary artery disease from a single center and found no difference between patients with and without CKD in terms of LMCA disease prevalence. After propensity score matching, the similarity of LMCA prevalence persisted.

Chronic kidney disease is well known to be associated with coronary artery disease but its relationship with LMCA

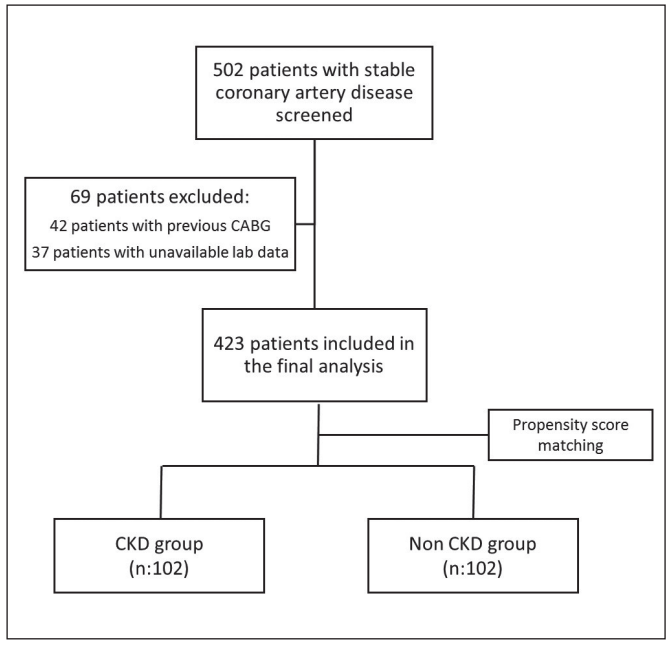

Figure 1: Flow chart of the study.

Table II: Baseline characteristics of patients with or without CKD.

	Non CKD (n=321)	CKD (n=102)	p value
Age	61.05±9.69	61.17±11.84	0.922
Gender-male	254 (79.1)	66 (64.7)	0.005
HTN (n %)	260 (81)	90 (88.2)	0.092
DM (n %)	137 (42.7)	57 (55.9)	0.02
DL (n %)	152 (47.4)	42 (41.2)	0.305
Smoking (n %)	165 (51.4)	31 (30.4)	<0.001
Creatinine (mg/dl)	0.90±0.19	3.96±3.06	<0.001
eGFR (ml/min/1.73 m²)	88.36±19.17	29.22±20.93	<0.001
Gensini score	58.66±33.77	57.62±28.69	0.002
Any LMCA lesion (n %)	27 (26.5)	31 (30.4)	0.807
Critical LMCA lesion (n %)	72 (22.4)	22 (21.6)	0.892
3VD (n %)	108 (33.6)	28 (27.4)	0.129
Critical LMCA+3VD (n %)	54 (16.8)	9 (0.08)	<0.01

(**3VD:** three vessel disease; **CKD:** chronic kidney disease; **DL:** dyslipidemia; **DM:** diabetes; **eGFR:** estimated glomerular filtration rate; **HTN:** hypertension; **LMCA:** left main coronary artery).

Table III: Baseline characteristics of matched subjects with or without CKD.

	Non CKD (n=102)	CKD (n=102)	p value
Age	61.05±9.69	61.17±11.84	0.922
Gender-male	79 (77.5)	66 (64.7)	0.063
HTN (n %)	82 (80.2)	90 (88.2)	0.177
DM (n %)	48 (47.1)	57 (55.9)	0.207
DL (n %)	49 (48)	42 (41.2)	0.324
Creatinine (mg/dl)	0.88±0.18	3.96±3.06	<0.001
eGFR (ml/min/1.73 m²)	89.03±20.39	29.22±20.93	<0.001
Gensini score	70.29±37.61	57.62±28.69	0.800
Any LMCA lesion (n %)	104 (32.4)	31 (30.4)	0.535
Critical LMCA lesion (n %)	18 (17.6)	22 (21.6)	0.481

(**CKD:** chronic kidney disease; **DL:** dyslipidemia; **DM:** diabetes; **eGFR:** estimated glomerular filtration rate; **HTN:** hypertension; **LMCA:** left main coronary artery).

disease is not clearly established. This relationship is important because the course of LMCA disease in chronic kidney patients, as previously mentioned, is complicated. Another factor is that even the most contemporary trials on the topic of stable coronary artery disease do not include patients with reduced kidney function (9-11).

Baseline characteristics of patients in our study was similar to the previous studies that included stable coronary artery disease patients. In a registry study by De Luca et al, 5070 consecutive patients with stable coronary artery disease were included. Similar to our study, 80% of the patients had hypertension and 30.7% had diabetes. In contrast to our study, the CKD prevalence was 11.8% (12).

To our knowledge there is no study in the literature regarding prevalence of LMCA in chronic kidney disease patients so our study is unique and important in this manner. The majority of trials supply data about the prevalence of CKD in LMCA disease groups. In a study by Lee et al., the prevalence of CKD was 4.2% in 3504 patients with LMCA (13).

There are scarce data about the association between LMCA and CKD in the literature. Dan et al. investigated 626 consecutive patients with significant coronary artery stenosis (14). Patients with LMCA disease had higher rates of CKD than those without LMCA disease. In our study, patients with coronary artery disease had more extensive

coronary artery disease but prevalence of LMCA disease was not different from the patients with normal kidney function. After propensity score matching the similarity persisted. This finding may be explained by the unique pathophysiological mechanisms underlying atherosclerosis in chronic kidney disease and left main coronary artery disease. Gehani et al. found renal failure as an independent predictor of LMCA disease (adjusted odds ratio: 2.6; 95% confidence interval: 1.43-4.69) in a matched cohort of patients with 3 vessel disease or LMCA disease who were candidates for surgical revascularization (15). The baseline characteristics, however, were significantly different between the groups and patients with acute coronary syndrome were also included in the study. These factors might explain the different results compared to our study.

Patients with CKD has significantly higher age-adjusted cardiovascular mortality than the general population. A strong negative correlation also exists between eGFR and mortality (16). However, the contribution of LMCA disease to cardiovascular mortality in this special group is not fully understood. Understanding the nature of the relationship between LMCA disease and CKD is therefore of great importance.

Our study has several limitations. First, the original cohort was not selected randomly but this limitation was overcome by propensity score matching. Second, the etiological factors for chronic kidney disease were not established for each patient. Third, the anatomical distinction of left main disease (ostial, shaft or distal) was not available.

CONCLUSION

In patients with stable coronary artery disease, the prevalence of critical LMCA disease was not different between patients with and without CKD in a propensity score matched cohort. Further studies are needed to establish the core nature of this relationship and the contributing factors.

All authors declare no conflict of interest.

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