Medicine Journal
2015; 2(1): 1-4
Published online January 20, 2015 (http://www.openscienceonline.com/journal/med)

Evaluation of acute coronary syndrome in patients with chronic renal failure

Sokol Myftiu[1], Artan Shkoza[2], Vera Halili[3], Gentian Vyshka[2, *]

[1]Service of Cardiology, University Hospital Center "Mother Theresa", Tirana, Albania
[2]Biomedical and Experimental Department, Faculty of Medicine, University of Medicine, Tirana, Albania
[3]Faculty of Medical Sciences, Albanian University, Tirana, Albania

Email address

sokolmyftiu@yahoo.com (S. Myftiu), artanshkoza80@yahoo.com (A. Shkoza), vera1961@hotmail.com (V. Halili), gvyshka@gmail.com (G. Vyshka)

To cite this article

Sokol Myftiu, Artan Shkoza, Vera Halili, Gentian Vyshka. Evaluation of Acute Coronary Syndrome in Patients with Chronic Renal Failure. *Medicine Journal*. Vol. 2, No. 1, 2015, pp. 1-4.

Abstract

Chronic renal failure is a highly complicated occurrence, with severe metabolic and functional changes affecting almost the entirety of body organs. Coronary artery syndrome and angina events are encountered with an increased prevalence among patients suffering from renal failure, even more during end-stage renal injury. We have studied retrospectively a group of patients suffering from a coronary episode concomitant to the chronic renal failure which served as the background disorder. Patients suffering from chronic renal failure will present higher morbidity and mortality when a stenotic coronary artery will become symptomatic. Metabolic changes following renal dysfunction play an important role toward the acceleration of atherosclerotic changes commonly found in this group of patients. A holistic approach to all accompanying risk factors, through an individualized and timely pharmacological treatment will help producing better final outcomes for chronic renal failure patients that present with a coronary artery episode.

Keywords

Acute Coronary Syndrome, Chronic Renal Failure, Coronary Artery Syndrome, Myocardial Infarction

1. Introduction

Chronic renal failure (CRF) defined as the presence of kidney damage, manifested by abnormal albumin excretion or decreased kidney function, quantified by measured or estimated glomerular filtration rate (GFR), that persists for more than 3 months (1, 2). GFR is a major and reliable parameter for extra-renal manifestations of this very complex disorder. A consistent bulk of cardiovascular research has concluded that the risk for acute myocardial infarction (AMI), restenosis of the coronary arteries, heart failure and death due to cardiovascular disorder is increased with a GFR less than 60 ml/min/1, 73 m^2; a value corresponding with a plasma creatinine level higher than 1.5 mg/dL (3, 4).

The acute coronary artery syndrome encompasses clinical manifestations such as chest pain, ECG changes and increased plasmatic levels of several cardiac biomarkers (5). CAS spectrum includes the unstable angina, the non-ST segment elevation acute myocardial infarction, as well as the ST-segment elevation AMI (6).

Scholars have shown that between patients where exist comorbidity between CRF and coronary artery syndrome (CAS), CRF itself is a major risk factor for cardiovascular occurrences:

a The morbidity is higher, if CRF is present;
b Patients with CRF undergo less frequently therapies with a proven efficacy;
c CRF provokes a higher incidence of adverse effects from adopted pharmacological treatments;
d Pathophysiological anomalies intrinsic to CRF will lead to an accelerated and aggravated cardiovascular picture (7).

Patients suffering from chronic renal failure will present higher morbidity and mortality when the stenotic coronary artery will become symptomatic. Metabolic changes

following renal dysfunction play an important role toward the acceleration of atherosclerotic changes commonly found in patients with CRF (8, 9). Thus, an abnormally high prevalence of atherosclerosis among CRF patients needs an accurate identification of risk factors, and appropriate therapies.

2. Methodology

The study is a retrospective one, with the group of patients composed from previous hospitalizations in the Service of Cardiology, University Hospital Center of Tirana. The time period covered from this study extends from January 1st, 2009 to August 31st, 2012. All clinical interviews, examinations and laboratory tests were performed at the same facility.

During this time period 2574 patients were diagnosed with coronary artery syndrome (CAS), but out of these only 50 were suffering from chronic renal failure (CRF) and CAS in a concomitant form. The data were registered in the medical files and were consulted later; data of interest were represented in percentages, when of a discrete nature. Tables and graphs were composed to illustrate these findings.

3. Results

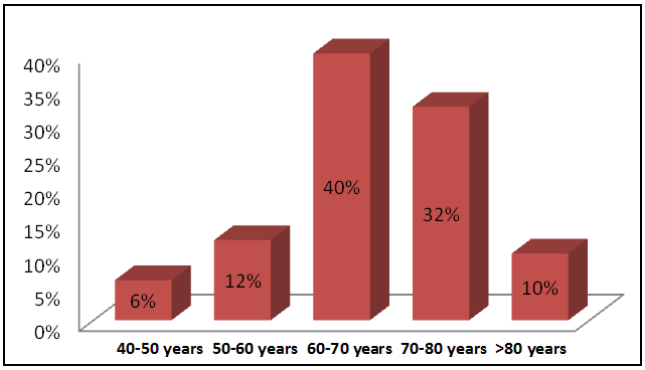
Following parameters were collected and studied in the sample group of patients (a total of 50 patients) suffering from CAS and CRF:

a Age;
b Gender;
c Body-mass index (BMI);
d Clinical signs and symptoms;
e Risk factors;
f Creatinine plasma levels;
g Other laboratory findings.

With regard to the age of our study group, we had a mean of 67, 7 years ± 8, 1 year. Patients suffering from CRF and CAS were stratified in age subgroups, thereby we found the highest percentage of affected persons pertaining to the sixth decade of life (60-70 years old), followed from the next decade of life (Graphic 1).

When considering the gender distribution in our study group, we had a clear predomination of male patients (84%) when compared with females (14%). Thus we had a total absolute number of 42 male patients suffering from CRF and CAS, and only 8 females.

Through the well-known formula of the body-mass index (as coined from Adolphe Quetelet half and a century before) we obtained the necessary data to separate patients with normal weight, overweight and obese (10, 11). Such a distinction is of great significance, since large studies have definitely proven that overweight and obesity are important risk factors for CAS in the patients suffering primarily from chronic renal failure (12, 13). Nevertheless, recent findings have surprisingly found an 'obesity paradox', with CRF patients surviving longer (14).



Graphic 1. *Age profile of the study group*

In fact, we found 70% of our patients overweight and 22% of the obese (Table 1). Contrarily, in the control group (CRF patients without CAS) we had 56% of patients overweight, 18% obese and 26% of them considered as with a normal body weight.

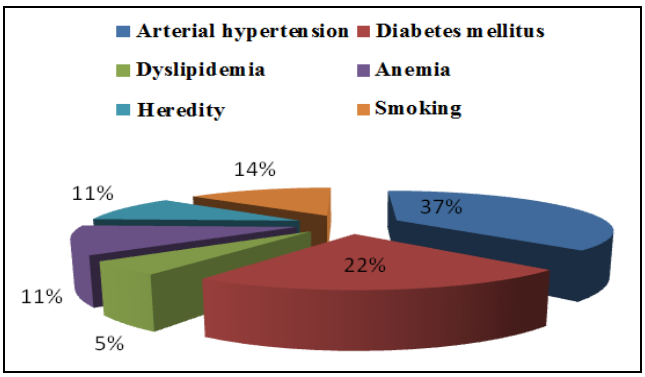
Table 1. *BMI in the study group*

Body-mass index	Number of patients	Percentage
<18, 5	0	0%
18,5 – 24, 9	4	8%
25 – 29, 9	35	70%
>30	11	22%

Clinical signs and symptoms encountered in the patients co-diagnosed with CRF and CAS included a variety of findings, whose frequency in our study group is described in the Table 1. Chest pain and dyspnea predominated in the clinical picture, but excessive muscular weakness, declive edemas, abnormal sweating and headaches were encountered as well.

Table 2. *Signs and symptoms in our study group*

Clinical signs	Number of patients	Percentage
Chest pain	45	90%
Dyspnea	40	80%
Weakness	19	38%
Sweating	14	28%
Headache	12	24%
Declive edemas	5	10%
Palpitations	5	10%



Graphic 2. *Frequency of risk factors in our study group*

During the scanning of our study group for other cardiovascular risk factors we registered in a decreasing frequency arterial hypertension; diabetes mellitus; dyslipidemia; anemia; heredity and smoking (Graphic 2).

Patients suffering from CRF will have abnormally high plasmatic levels of creatinine, and its evaluation is indispensable for the staging of the background disease. We found 40% of patients with creatinine levels equaling 2, 7 – 3, 7 mg/dL, with other subgroups presenting lower or higher levels from this predominating fraction (Table 3).

Table 3. *Levels of plasmatic creatinine in our study group*

Plasma creatinine (mg/dL)	Number of patients	Percentage
1, 7 – 2, 6	16	32%
2, 7 – 3, 7	20	40%
3, 8 – 4, 7	6	12%
> 4, 7	8	16%

We gathered as well different laboratory parameters from plasmatic samples, as summarized in the Table 4.

Table 4. *Blood chemistry values in the study group*

Parameter (plasma sample)	Minimum value found (mg/dL)	Maximum value registered (mg/dL)	Mean value (mg/dL)	Standard deviation
Blood sugar	70	316	140	±54
Creatinine	0.94	8.48	3.3	±2.08
Urea	29.5	367	122.54	±25.7
Haemoglobin (g/dL)	5.4	16.8	10.5	±2.31
Cholesterol	75.5	250	159	±45
LDL-cholesterol	27.1	155	105.1	±22.3
HDL-cholesterol	23.23	57.27	34.25	± 4.5
Triglycerides	42	729	147	± 94

Following the study of plasmatic parameters sampled in this group, we had a consistent increase in the values of glycemia, plasma creatinine, urea levels; as well as decreased levels of haemoglobin.

4. Discussion

Patients suffering from chronic renal failure seem to have higher mortality rates related to coronary artery syndrome. Metabolic changes deriving from renal dysfunction will obviously play a very aggressive role towards accelerating the atherosclerotic process among CRF patients (15, 16). The high prevalence of atherosclerosis among individuals with end-stage renal disease will absolutely request an early identification of all other potentially treatable risk factors (17, 18). As a rule, the treatment of CAS in this group of patients (namely individuals with CRF) has been non-invasive.

The evaluation and the treatment of CRF patients manifesting a coronary artery episode, or syndrome, will encompass the risk factors management, the tight follow-up of clinical evolution of CAS, drug therapy and percutaneous re-vascularisation attempts.

Out of 2574 patients suffering with CRF we had a total of fifty individuals having CAS, equaling approximately 2% of the entirety of patients suffering from the renal background disorder. In this subgroup of fifty patients we had a clear male preponderance, and hormonal influence is obvious in this setting, although the proclaimed protective role of estrogens might be more apparent than real (19). In fact, gender differences in life style and socio-medical behaviour must have their say (20).

Our study pointed out as well a clear presence of overweight and obesity among patients suffering from CRF and CAS (respectively 70% and 22%), with a meager 8% from the overall group presenting a normal body-mass index. Authors suggest that body weight control measures, combined with regular physical activity, will protect from myocardial ischemia, among other (21, 22). Arterial hypertension and diabetes mellitus were the most frequent risk factors encountered in our study group; hence their early diagnosis and specialized treatment will beyond doubts produce a better final outcome, in all clinical situations.

Another parameter that needs a tight control is plasma creatinine. A consistent bulk of data suggests that the risk for myocardial infarction, coronary re-stenosis, heart failure and heart-related deaths becomes increasingly dangerous if the glomerular fraction is less than 60 ml/min/1, 73 m^2; such a value corresponds approximately with a plasma creatinine higher than 1, 5 mg/dL (23, 24). In fact, the endogenous creatinine is completely filtrated at the level of renal glomerulus, thus it might serve as a raw indicator of the renal function.

Mean hemoglobin values in our study group were low enough (10, 5 g/dL) to raise concerns about high presence of anemia in CRF patients, since anemia alone predisposes patients for angina pectoris events, and causes left ventricle hypertrophy (25, 26). A diversity of etiological factors makes anemia omnipresent among CRF patients, with deficient erythropoietin production being probably the most important.

A holistic approach to all over-mentioned factors, through an individualized and timely pharmacological treatment, will help producing better final outcomes for chronic renal failure patients that present with a coronary artery episode.

Abbreviations

CRF = chronic renal failure; GFR = glomerular filtration rate; AMI = acute myocardial infarction; CAS = coronary artery syndrome; ECG = electrocardiogram.

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