Najvažnija obilježja koronarografiranih pacijenata liječenih u Koronarnoj intenzivnoj skrbi Kliničkog bolničkog centra Osijek

The most important characteristics of coronarographed patients treated in the Coronary Intensive Care of the University Hospital Center Osijek

Zvonimir Popović[1]*, Nikola Raguž Lučić[1], Mario Šafer[1], Robert Steiner[1], Marija Heffer[2]

[1]Klinički bolnički centar Osijek, Osijek, Hrvatska
[2]Medicinski fakultet, Sveučilište Josipa Jurja Strossmayera u Osijeku, Osijek, Hrvatska
[1]*University Hospital Center Osijek, Osijek, Croatia*
[2]*School of Medicine, J.J. Strossmayer University of Osijek, Osijek, Croatia*

SAŽETAK: Koronarna bolest srca (KBS), zajedno s drugim bolestima iz skupine kardiovaskularnih bolesti, ima značajan udio u morbiditetu i mortalitetu stanovništva, posebno među razvijenim zemljama. Cilj ovog istraživanja bio je utvrditi učestalost kardiovaskularnih čimbenika rizika u hospitaliziranih pacijenata podvrgnutih koronarografiji, s posebnim osvrtom na spol. U analizu je uključeno 196 pacijenata (106 muškaraca i 90 žena) iz Koronarne intenzivne skrbi Kliničkog bolničkog centra Osijek koji su tijekom 2010. godine bili podvrgnuti postupku koronarografije. Pored demografskih podataka i indeksa tjelesne mase, analizirani su podaci o koronarografskom postupku, tipu KBS i karakteristikama suženja koronarnih arterija te podaci dobiveni aortografijom i lijevom ventrikulografijom. Utvrdili smo da su koronarografirane osobe češće muškog spola, starije dobi, pretili i dijabetičari. U većini slučajeva, dominantna je bila desna koronarna arterija, a najviše ispitanika imalo je jednožilnu koronarnu bolest. Kod 40,7% pacijenata izvršena je perkutana koronarna intervencija, a u 27,3% slučajeva preporučeno je aortokoronarno premoštenje. Osobe ženskog spola bile su češće starije dobi, uz prisutnost više čimbenika rizika. U žena je bila češća i veća stenoza na lijevoj prednjoj silaznoj arteriji. Ovo istraživanje potvrđuje dosadašnja saznanja, jer su osobe s više čimbenika rizika bile izloženije nastanku KBS.

KLJUČNE RIJEČI: koronarografija, koronarna bolest srca, kardiovaskularni čimbenici rizika.

SUMMARY: Coronary artery disease (CAD), along with other diseases from the group of cardiovascular diseases holds a significant share in the morbidity and mortality of the population, especially among developed countries. The aim of this study was to determine the prevalence of cardiovascular risk factors in hospitalized patients undergoing coronary angiography thereby placing a special emphasis on gender. The analysis includes 196 patients (106 men and 90 women) from the Coronary intensive Care, University Hospital Center Osijek that during 2010 underwent coronary angiography. In addition to demographic data and body mass index, the analysis encompassed the data on coronary angiography procedure, type of CAD and characteristics of narrowing of coronary arteries and the data obtained by aortography and left ventriculography. We have found that coronarographed patients are usually men, older, obese persons and diabetics. In most cases, the right coronary artery was dominant, while the greatest number of patients had a one-vessel coronary artery disease. Some 40.7% of patients underwent percutaneous coronary intervention, while coronary artery bypass graft was recommended to 27.3% of patients. Female patients were usually older, with the presence of multiple risk factors. More frequent and more extensive left anterior descending artery stenosis was recorded in women. This study confirms previous insights, because persons with multiple risk factors were more vulnerable to the occurrence of CAD.

KEYWORDS: coronarography, coronary artery disease, cardiovascular risk factors.

CITATION: Cardiol Croat. 2013:8(7-8):235-241.

Uvod

Velika skupina kardiovaskularnih bolesti (KVB), a tu pripada i koronarna bolest srca (KBS), kao vodeći uzrok smrti diljem svijeta, predstavlja veliki javnozdravstveni problem i polako prerastaju u pravu epidemiju globalnih razmjera. Proces nastanka, čimbenici rizika i patološke promjene koje ih slijede dobro su poznati. Od kardiovaskularnih čimbenika rizika možemo spomenuti kao najznačajnije arterijsku hipertenziju, pušenje cigareta, dislipidemiju, dijabetes, smanjenu tjelesnu aktivnost[1,2]. Diljem svijeta KVB imaju udio od 30,5% u ukupnoj smrtnosti[3]. Prema podacima Hrvatskog zavoda za javno zdravstvo za 2011. godinu udio skupine KVB kao uzroka smrti u Hrvatskoj iznosi 48,7% što predstavlja vodeći uzrok smrti, služi kao potvrda velikog javnozdravstvenog značaja ove skupine bolesti[4].

Značajne su razlike u pojavnosti KVB registrirane među spolovima. Rizik za razvoj ove skupine bolesti u žena raste nakon menopauze[5]. U tom razdoblju ženina života dolazi do naglog porasta vrijednosti ukupnog kolesterola, LDL kolesterola i triglicerida, sniživanja vrijednosti HDL kolesterola te pogoršanja regulacije glukoze u krvi, sve kao posljedica manjka estrogena[6]. Činjenica je da žene u prosjeku 10-15 godina kasnije obole od KBS, što se smatra posljedicom zaštitnog djelovanja pretežno estrogena u generativnoj dobi žene. Rizik za razvoj arterijske hipertenzije nakon menopauze se povećava za 3,5 puta, a pojava hipertenzije u 70% žena dovodi do nastanka koronarnih zbivanja[7]. To pokazuje i podatak da se žene oboljele od KBS prosječno hospitaliziraju sa 68, dok se muškarci hospitaliziraju sa 61 godinu života.[8] Patološki koronarogram je pet puta češći u muškaraca, ali u slučaju njegove dijagnoze, muškarci imaju bolje rezultate nakon postupka perkutane koronarne intervencije (PCI)[9-12].

Već spomenuti veliki epidemiološki značaj KBS, razlike u prevalenciji bolesti ovisno o spolu te potreba za definiranjem utjecaja različitih drugih čimbenika ovu bolest, naveli su nas na ovo istraživanje. Cilj je bio utvrditi učestalost kardiovaskularnih čimbenika rizika u hospitalliziranih pacijenata podvrgnutih koronarografiji, s posebnim osvrtom na spol.

Metode

U studiji smo analizirali podatke bolnički liječenih pacijenata u Koronarnoj intenzivnoj skrbi Kliničkog bolničkog centra (KBC) Osijek u 2010. godini, koji su bili podvrgnuti postupku koronarne angiografije. Uzorak pacijenata čiji su podaci prikupljeni je stratificirani randomizirani uzorak (stratificiran po spolu).

Pored demografskih podataka i indeksa tjelesne mase, analizirani su podaci o koronarografskom postupku, tipu KBS i karakteristikama suženja koronarnih arterija te podaci dobiveni aortografijom i lijevom ventrikulografijom.

Za testiranje normalne raspodjele vrijednosti numeričkih varijabli korišteni su Kolmogorov-Smirnov i Shapiro-Wilk testovi. Međusobna usporedba nominalnih varijabli u slučaju velikog broja uzoraka je provedena korištenjem Pearson χ^2 testa, dok je u slučaju malog broja uzoraka korišten Fisher's Exact Test. Kod usporedbe numeričkih s nominalnim varijablama, za varijable s normalnom raspodjelom vrijednosti primijenjen je parametrijski Studentov t-test, a za one koje nemaju normalnu raspodjelu korišteni su neparametrijski testovi Mann-Whitney i Kruskal-Wallis. Razina statističke značajnosti za sve testove kojima se provode usporedbe iznosi p<0,05.

Introduction

A large group of cardiovascular diseases (CVD), including coronary artery disease (CAD) as the leading cause of death worldwide is a major public health problem slowly growing into a real epidemic of global proportions. The process of occurrence, risk factors and pathological changes that accompany them are well known. Regarding cardiovascular risk factors, we can mention some of the most important ones, such as arterial hypertension, smoking cigarettes, dyslipidemia, diabetes, reduced physical activity[1,2]. CVD accounts for 30.5% in total mortality worldwide[3]. According to the Croatian National Institute of Public Health for the year 2011, the frequecy of the CVD group as a cause of death in Croatia is 48.7% and it is the leading cause of death, confirming a great public health importance of this group of diseases[4].

There are significant differences in the incidence of CVD recorded between the genders. The risk for the development of this group of diseases rises in women after menopause[5]. During this period of the woman's life, there are some changes that occur such as an sudden increase in the value of total cholesterol, LDL cholesterol and triglyceride levels, lowering of the HDL cholesterol values and impairment of blood glucose regulation all as a result of the lack of estrogen[6]. The fact is that on the average women start suffering from CAD 10-15 years later, which is considered to be the result of the protective effect provided mainly by estrogen in the woman's generative age. The risk of developing hypertension after menopause rises by 3.5 times, and the occurrence of hypertension in 70% of women leads to the occurrence of coronary events[7]. This is demonstrated by the fact that women with CAD are on the average hospitalized at the age of 68, while the men are hospitalized at the age of 61.[8] Pathological coronarogram is five times more common in men, but in case it is diagnosed, men have better results after the percutaneous coronary intervention procedure (PCI)[9-12].

The above-mentioned large epidemiological significance of CAD, differences in the prevalence of the disease, and the need for defining the impact of some other factors on this disease made us conduct this investigation. The aim was to determine the prevalence of cardiovascular risk factors in hospitalized patients undergoing coronary angiography placing a special emphasis on gender.

Methods

The study analyzed the data of patients treated in the hospital in the Coronary Intensive Care of the University Hospital Ceter (KBC) Osijek in 2010, who underwent the coronary angiography procedure. The sample of patients whose data were collected is the stratified randomized sample (stratified by gender).

In addition to demographic data and body mass index, the analysis included the data of coronary angiography procedure, a type of CAD and characteristics of narrowing of coronary arteries and the data obtained by aortography and left ventriculography.

Kolmogorov-Smirnov and Shapiro-Wilk tests were used for testing normal distribution of numerical variable values. The comparison of nominal variables in the case of a large number of samples was made by using Pearson χ^2 test, whereas Fisher's Exact Test was used in the case of a small number of samples. In case of comparison of numerical variables with nominal variables, the parametric Student's t-test was applied for variables with normal distribution of the

Rezultati

Analizirajući podatke 196 pacijenata (54,1% muškaraca i 45,9% žena) utvrdili smo prosječnu dob od 61,9 godine, s minimalnom dobi od 29, a maksimalnom od 83 godine. Prosječan BMI iznosi 28,4kg/m².

Koronarna angiografija je uspješno provedena kod 99% pacijenata uključenih u istraživanje. Sam postupak, od ulaska pacijenta u salu do izlaska iz nje, u prosjeku traje 49 minuta i 25 sekundi. Ako računamo samo trajanje postupka prosjek iznosi 25 minuta i 27 sekundi. Najviše korišteni kontrast je Visipaque (70,4%), s prosječnom količinom 248,9mL.

Analiza tipa dominacije, utvrdila je da je u 88,8% pacijenata ona je na strani desne koronarne arterije, u 6,1% pacijenata je lijeva koronarna arterija dominanatna, a 4,1% njih ima miješanu dominaciju. Što se tiče tipa, 32% ima jednožilnu, 21,6% dvožilnu, a 12,9% trožilnu KBS, a kod 33,5% pacijenata nema signifikantnih promjena na koronarnim arterijama. Najčešće stenoze zahvaćaju dvije ili više arterija (55,1% pacijenata), a ostalu distribuciju stenoza prikazuje **slika 1.**

value, while Mann-Whitney and Kruskal-Wallis nonparametric tests were used for those that do not have a normal distribution. The level of statistical significance for all tests used for conducing comparisons is p<0.05.

Results

Analyzing the data on 196 patients (54.1% men and 45.9% women), we have determined an average age of 61.9, with a minimum age of 29 and maximum age of 83. An average BMI is 28.4kg/m².

Coronary angiography was successfully conducted in 99% of patients involved in the investigation. The procedure itself takes 49 minutes and 25 seconds from the moment of entering of a patient into room by the time he/she leaves it. If we consider only the duration of the procedure, it lasts for 25 minutes and 27 seconds on the average. The most frequently used contrast agent is Visipaque (70.4%), with an average amount of 248.9mL.

The analysis of the type of domination found that in 88.8% of patients it is on the side of the right coronary artery and in 6.1% of patients the left coronary artery is dominant and 4.1% of them have mixed dominance. As for the type, 32% have a one-vessel, 21.6% have two-vessel and 12.9% have three-vessel CAD, while in 33.5% of patients there are no significant changes in the coronary arteries. Stenoses usually affect 2 or more arteries (55.1% of patients), and the other distribution of stenoses is shown in **Figure 1**.


Figure 1.

Distribution of stenoses in coronary arteries.

LAD - left anterior descending coronary artery
RCA - right coronary artery
Cx - circumflex coronary artery
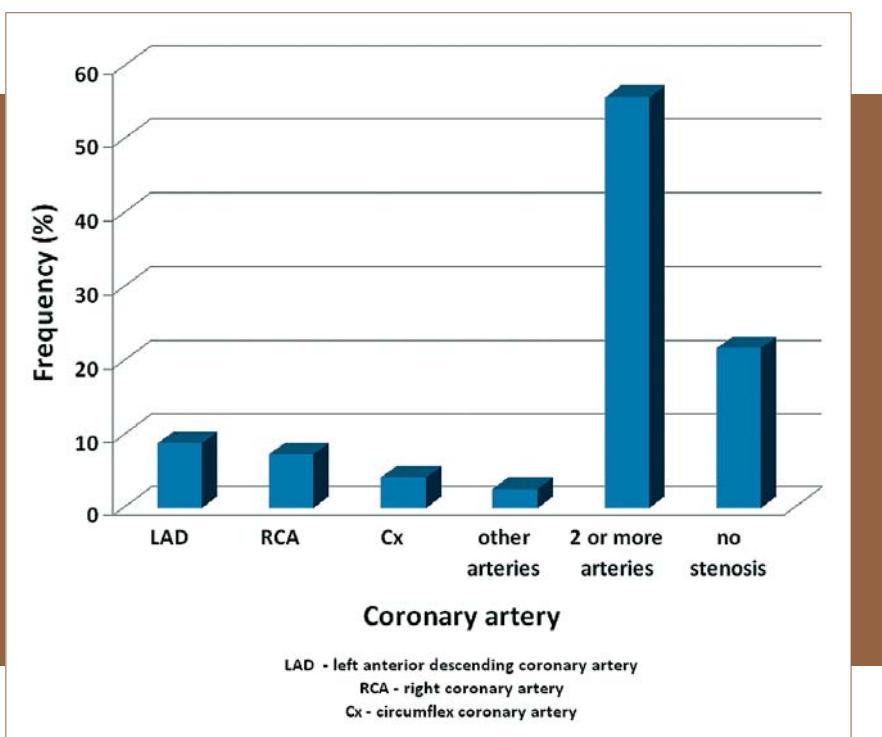
Prosječna vrijednost stenoze u glavnom deblu lijeve koronarne arterije (LMCA) iznosila je 53,8%, u lijevoj prednjoj silaznoj arteriji (LAD) 73,4%, u desnoj koronarnoj arteriji (RCA) 73,3% i u cirkumfleksnoj arteriji (Cx) 66,4%. Promatrani su i segmenti koji pokazuju suženje kod pojedinih krvnih žila (**slika 2**), a kod većine koronarnih arterija najveće suženje nalazi u srednjem dijelu.

The average value of stenosis in the left main coronary artery (LMCA) was 53.8%, in the left anterior descending artery (LAD) it was 73.4%, in the right coronary artery (RCA) it was 73.3% and in circumflex artery (Cx) it was 66.4%. The segments that show the narrowing in some blood vessels (**Figure 2**) have been observed, and the majority of coronary arteries are mostly narrowed in the medium part.
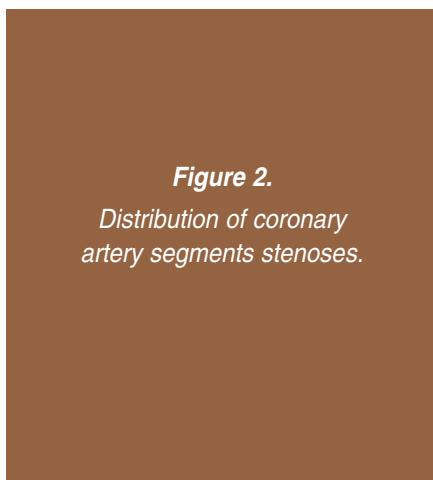
Figure 2.

Distribution of coronary artery segments stenoses.

Kod 89,2% ispitanika bila je uredna sistolička funkcija. Od regionalnih poremećaja kontraktilnosti kod 19,1% pacijenata registrirana je diskinezija, a apeks je bio najčešće anatomsko mjesto diskinezije (40,5% pacijenata), nakon njega slijede inferiorni (24,3%) i anteriorni zid (8,1%), dok su dva ili više mjesta zahvaćenih diskinezijom registrirana kod 27% ispitanika. Prosječna vrijednost ejekcijske frakcije (EF) iznosila je 54,2%, s tim da je najmanja izmjerena bila EF 15%, a najviša 80%. Regurgitacija je bila registrirana kod 25,3% pacijenata podvrgnuti koronarnoj angiografiji, s najčešćom zahvaćenošću mitralne valvule (63,3%), aortalna valvula bila je regurgitacijom zahvaćena kod 30,6%, a obje valvule istodobno kod 6,1% pacijenata. Stenoza zalistaka je registrirana kod 8,2% pacijenata; u 93,8% se ona nalazi na aortnoj valvuli.

Kod 79 pacijenata (40,7%) tijekom koronarne angiografije izvršen je i PCI. Kod 27,3% pacijenata je preporučen kardiokirurški zahvat, u njih 7,7% zamjena aortalne, a u 5,1% mitralne valvule.

Usporedba rezultata prema spolu

Ako uspoređujemo spol s drugim varijablama, postoji nekoliko razlika između muškaraca i žena. Uz očekivane razlike u težini i visini, statistički je značajna razlika u dobi, a žene također imaju i viši BMI od muškaraca, što prikazuje **tablica 1**.

Statistički značajna razlika postoji i prilikom usporedbe duljine trajanja samog postupka koronarne angiografije i spola, jer postupak kod muškaraca u prosjeku traje 27 min i 29 s, a kod žena 23 min i 2 s (p=0.036). Ne postoje značajne razlike niti u primjeni kontrasta, niti u njegovoj količini ovisno o spolu.

Slika 3 prikazuje razlike u tipu KBS, po kojem je u muškaraca nešto češće registrirana jednožilna, a kod žena trožilnu bolest, no ne postoji statistički značajna razlika (p=0.149, Pearson χ^2 test). Registrirana je značajna razlika u prosječnoj vrijednosti stenoze LAD (69,2% za muškarce nasprem 78,5% za žene; p=0.012, Mann-Whitney test).
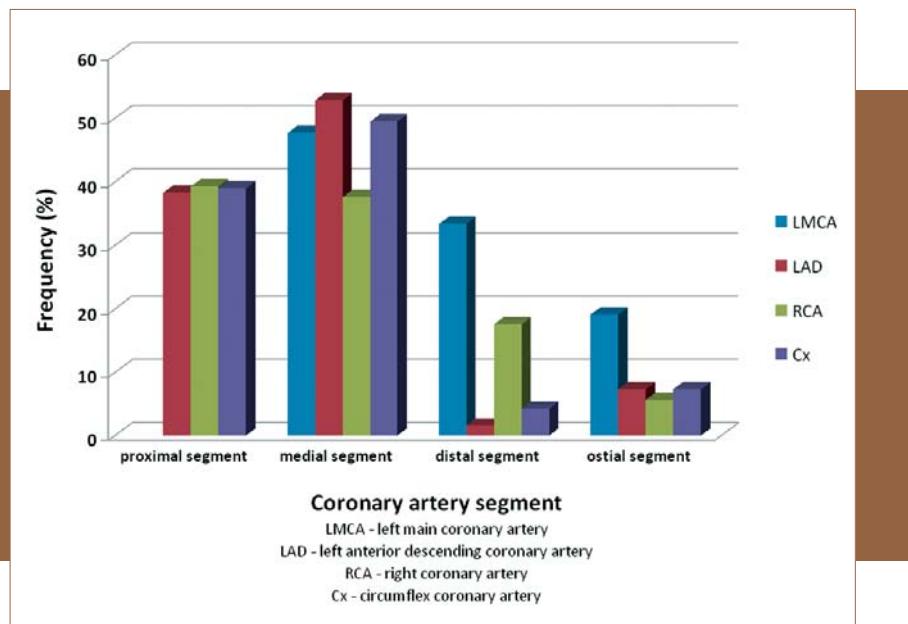
In 89.2% of patients the systolic function was normal. Of regional contractility disorders, dyskinesia was recorded in 19.1% of patients, and the apex was the most common anatomical location of dyskinesia (40.5% of patients), to be followed by inferior (24.3%) and anterior wall (8.1%), while the two or several locations affected by dyskinesia were recorded in 27% of patients. The average value of the ejection fraction (EF) was 54.2%, whereas the lowest measured EF was 15% and the highest 80%. Regurgitation was recorded in 25.3% of patients that underwent coronary angiography, whose mitral valve was most often affected (63.3%), aortic valve was affected by regurgitation in 30.6%, and the both valves were affected at the same time in 6.1% of patients. Valvular stenosis was recorded in 8.2% of patients, while it is located in the aortic valve in 93.8% of patients.

PCI was also performed in 79 patients (40.7%) at the time of coronary angiography. Cardiac surgery was recommended to 27.3% of patients, aortic valve replacement to 7.7% of them and mitral valve replacement was recommended to 5.1% of patients.

Comparison of results by gender

If we compare gender with other variables, there are several differences between men and women. With the expected differences in weight and height, a statistically significant difference lies in the age, and women also have a higher BMI than men, as shown in **Table 1**.

A statistically significant difference exists when making a comparison between the length of the procedure of coronary angiography and gender, because the procedure in men, on the average, lasts for 27 min and 29 s, and in women it lasts for 23 min and 2 s (p=0.036). There are no significant differences in the application of contrast agent and in its quantity depending on gender.

Figure 3 shows the differences in the type of CAD, according to which the one-vessel disease is somewhat more often in men, the three-vessel disease is more often in women, but statistically there is no significant difference (p=0.149, Pearson χ^2 test). A significant difference is recorded in the average value of LAD stenosis (69.2% for men versus 78.5% for women, p = 0.012, Mann-Whitney test).

Table 1. *Gender differences in age, height, weight and body mass index.*

	Gender	Mean	Standard deviation	p
Age (years)	Male	59.98	9.990	0.002
	Female	64.24	10.916	
Height (cm)	Male	175.23	6.698	<0.001
	Female	161.28	4.892	
Weight (kg)	Male	85.23	13.580	<0.001
	Female	75.61	12.315	
Body mass index (kg/m²)	Male	27.76	4.128	0.036
	Female	29.08	4.580	

Figure 3.

Gender differences in types of coronary artery diseases.

CAD - coronary artery disease
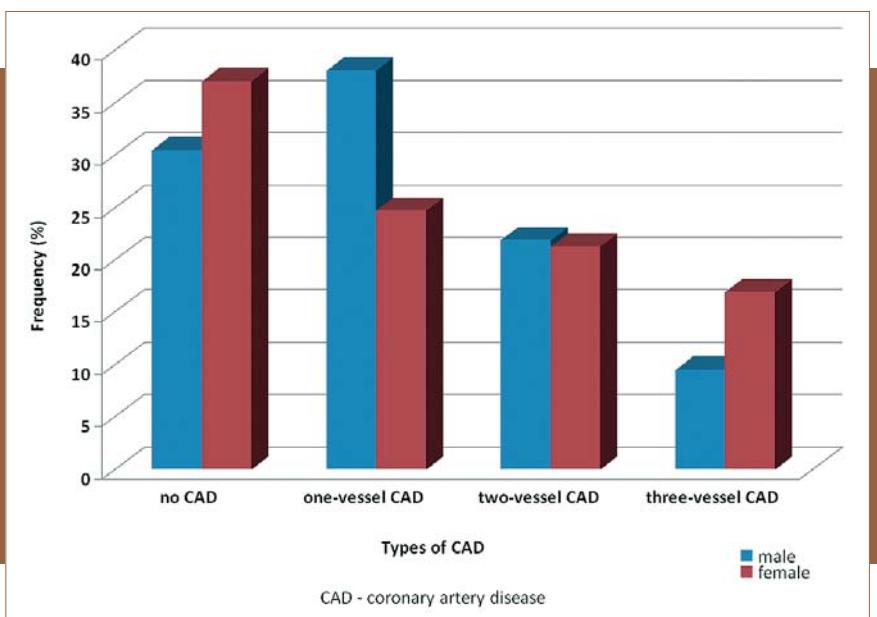
Diskusija i zaključak

Prethodne studije su dokazale iznimnu važnost KBS na ukupnu stopu mortaliteta, posebno u razvijenim zemljama. Također je utvrđeno da žene češće imaju neopstruktivnu KBS, dok muškarci češće pokazuju opstrukcije[13-19]. Promatrajući rizike za razvoj opstruktivne koronarne bolesti, možemo uočiti da je prevalencija opstruktivne KBS niska u premenopauzalnih žena, ali se povećava nakon 50 godine, što sugerira zaštitnu ulogu estrogena[16].

Svoje istraživanje smo usmjerili na područje Slavonije i Baranje, dijela Hrvatske koji je najizloženiji i najpogođeniji epidemijom KBS. Prateći smrtnost od KVB u populaciji životne dobi do 64 godine tijekom razdoblja od 1998. do 2009. godine za području Slavonije registrirane su više dobno standardizirane stope smrtnosti od KVB ukupno, cerebrovaskularnih bolesti i KBS nego u Republici Hrvatskoj. Na području Slavonije postoji trend smanjenja stopa, sličan državi i to stopa KVB ukupno, cerebrovaskularnih bolesti te KBS samo

Discussion and Conclusion

Previous studies have shown the utmost importance of CAD on the overall rate of mortality, especially in developed countries. It was also found that women are more likely to have non-obstructive CAD, whereas men often show obstructions[13-19]. Considering the risks for the development of obstructive coronary artery disease, we can notice that the prevalence of obstructive CAD is low in premenopausal women, but it rises after 50 years of age, suggesting a protective role of estrogen[16].

We focused our investigation on the Slavonia and Baranja, the Croatian part that is the most exposed region to and the most affected region by the CAD epidemic. Monitoring the death rate from CVD in the population aged up to 64 over the period from 1998 to 2009, higher age-standardized mortality rates from CVD in total, cerebrovascular diseases and coronary artery diseases were recorded in Slavonia than in the Republic of Croatia. In the region of Slavonia there is a

kod u žena, dok stope smrtnosti od KBS u muškaraca ne pokazuju promjene tijekom spomenutoga desetogodišnjeg razdoblja praćenja[20].

Osnovni podaci iz ovog istraživanja ukazuju da su pacijenti teži i niži od prosjeka populacije. Stoga ne čudi da i prema indeksu tjelesne mase, koji iznosi 28,37 kg/m², pripadaju grupi osoba s prekomjernom tjelesnom težinom, slično drugim autorima[21].

Proces izvođenja koronarografije traje oko 50 minuta, uz najčešće korištenje Visipaque kontrasta u količini od 250 mL. Postotak pacijenata nad kojima nije bilo moguće izvesti koronarografiju iznosio je samo 1%, pa možemo zaključiti da je ona širokoprimjenjiv postupak.

Očekivano, RCA je u najvećem broju slučajeva dominantna i opskrbljuje većinu srca. Stenoza LAD je najučestalija od pojedinačnih stenoza. Prosječne vrijednosti stenoze glavnih koronarnih žila kreću se oko donje granice za samu dijagnozu signifikantne stenoze, tj. za LMCA iznose oko 50%, dok za druge koronarne arterije iznose oko 70%. Te granične vrijednosti mogu doprinijeti umjetno manjem broju arterija sa signifikantnom stenozom i blažoj dijagnozi, ali je činjenica da će te granične stenoze vremenom pogoršati. Srednji segment glavnih koronarnih arterija je u svim slučajevima najčešće mjesto stenoze.

Od drugih srčanih poremećaja, u naših pacijenata je češća diskinezija (i to najčešće na apeksu) od sistoličke disfunkcije (19% naspram 11%). Regurgitacija se javlja u čak 25% pacijenata, možemo pretpostaviti kao rezultat postojanja ishemije zidova i posljedično smanjene funkcije valvula. Mitralna valvula je najčešće insuficijentna, dok je kod stenoze (samo 8% u ovih pacijenata) zahvaćena aortalna valvula.

Uloga koronarne angiografije u terapiji KBS potvrđena je visokim postotkom pacijenata nad kojima je izvršena perkutana koronarna intervencija i ugrađen stent, a taj postotak iznosi oko 40%.

U istraživanju smo također htjeli identificirati određene varijable s utjecajem na razvoj KBS u žena, slično drugim autorima. Mnogo toga objašnjava prilično veća starost žena u odnosu na muškarce, iz čega proizlazi relativna zaštićenost žena prije menopauze i izjednačavanje rizika za KBS nakon pojave menopauze. Također, žene, zbog svoje starije dobi, imaju veći komorbiditet i lošije regulirane rizične faktore, a sve te činjenice zajedno dovode do lošijeg ishoda koronarne bolesti u žena[22,23]. Žene također imaju manju visinu i nešto manju težinu, ali zato statistički značajnije veći ITM od muškaraca što je još jedan čimbenik rizika koje opisuju i drugi autori[24,25].

Iako naizgled kontradiktorno zvuči da sam proces koronarografije traje kraće u žena, treba imati na umu da je u žena veća učestalost neopstruktivne koronarne bolesti kod kojeg nije indicirana primjena PCI. Jedna statistički značajna razlika među spolovima koja je posebno intrigantna je značajno više suženje LAD kod žena nego kod muškaraca.

Zaključno, pacijenti podvrgnuti koronarografiji imaju već prisutne čimbenike rizika za KBS, kao što su visok ITM i starija životna dob. Nalaz koronarografije najčešće ukazuje na jednožilnu bolest. Stenoze glavnih koronarnih arterija su u prosjeku granične, isto kao i prosječna vrijednost ejekcijske frakcije. Analiza prema spolu utvrdila je da su ispitanice ženskog spola bile starije, uz prisutnost više čimbenika rizika, s češćom i većom stenozom LAD. Potrebno je redovito provoditi screening i ranije dijagnosticirati KBS. Vrlo je važna i primarna prevencija kardiovaskularnih čimbenika rizika, a

falling rate trend, similar to the trend in the Croatian state, of CVD rates in total, cerebrovascular diseases and CAD only in women, while death rates from CAD in men show no changes over the aforementioned ten years' period of monitoring[20].

The basic data from this study suggest that patients weigh more and are shorter ih height than the average population. It is not surprising that according to the body mass index which is 28.37 kg/m², they are classified in the group of people who are overweight, similar to the studies of some other authors[21].

The process of performing coronary angiography takes about 50 minutes, thereby most commonly using the Visipaque contrast agent in the amount of 250 mL. Coronary angiography could not be performed only on 1 percent of patients, so we can conclude that it is a widely applicable procedure.

As expected, the RCA is in most cases dominant and supplies most of the heart. LAD stenosis is the most common of all specific stenoses. Average values of stenosis of main coronary vessels are around the lower limit for the actual diagnostics of significant stenosis, that is, for LMCA they account for 50%, while for the other coronary arteries they account for 70%. These limit values can contribute to an artificially lower number of arteries with significant stenosis and milder diagnosis, but the fact is that these marginal stenoses will worsen over time. The medial segment of the main coronary arteries is the most common location of stenosis in all cases.

Of other cardiac disorders, our patients more frequently suffer from dyskinesia (usually on the apex) than from systolic dysfunction (19% vs. 11%). Regurgitation occurs in as many as 25% of patients, we can consequentially assume impaired function of valves as a result of the existence of wall ischemia. Mitral valve is usually insufficient, while in case of stenosis (only 8% in these patients) aortic valve is the most affected.

The role of coronary angiography in the treatment of CAD has been confirmed by a high rate of patients that have been subjected to percutaneous coronary intervention and who underwent the stent implantation, and this percentage is around 40%.

In our investigation, we also wanted to identify specific variables affecting the development of CAD in women, similar to other authors. Much of this is explained by an older age of women than men, which implies a relative protection of women prior to menopause and equalization of risk for coronary disease after the menopause. Women have a higher rate of comorbidity and less regulated risk factors as a result of their older age, and all these facts commonly lead to poorer outcome of coronary artery disease in women[22,23]. Women are also shorter in height and have somewhat lower weight, but statistically they have significantly higher BMI than men, which is another risk factor as described by some other authors[24,25].

Although it is contradictory at a first glance that the process of angiography lasts shorter in women, it should be borne in mind that higher prevalence of non-obstructive coronary artery disease is recorded in women, where no PCI procedure is indicated. One statistically significant difference between the genders that is particularly intriguing is significantly increased narrowing of LAD in women than in men.

To conclude, the patients undergoing coronary angiography already have risk factors for CAD, such as high BMI and

identifikacija što više protektivnih čimbenika bi trebala postati prioritet.

older age. The coronarography findings usually indicate the one-vessel disease. Main coronary artery stenoses are on the border of normal values, the same as the average value of the ejection fraction. The analysis by gender found that female patients were older, with the presence of multiple risk factors, with greater and more frequent LAD stenosis. Earlier conduction of screening, and subsequent early detection of CAD is needed. Primary prevention of cardiovascular risk factors is also very important, while the identification of as many protective factors as possible should be a priority.

Literature

1. Steiner R. Različitost rizičnih čimbenika kod pojedinih tipova koronarnih lezija (disertacija). Osijek: Sveučilište Josipa Jurja Strossmayera u Osijeku, Medicinski fakultet. Osijek, 2007.

2. Gami AS, Witt BJ, Howard DE, et al. Metabolic syndrom and risk of incident cardiovascular events and death. J Am Coll Cardiol. 2007;49(4):403-14.

3. World Health Organization [Internet]. Data repository - Mortality and burden of disease - Cause-specific mortality, 2008 - WHO regions [cited 2012 June 12]. Avaliable from: http://apps.who.int/ghodata/?vid=10012.

4. Ćorić T, Miler A. Umrle osobe u Hrvatskoj u 2011. godini, Zagreb, Hrvatski zavod za javno zdravstvo [Internet] 2012 [cited 2013 June 12] Avaliable from: http://www.hzjz.hr/publikacije/umrli_2011.pdf.

5. Stangl V, Baumann G, Strangl K. Coronary artery risk factors in women. Eur Heart J. 2002;23(22):1738-52.

6. Pepine C. Ischemic heart disease. J Am Coll Cardiol. 2006;47(3 Suppl S):S1-3.

7. Shaw LJ, Merz CNB, Pepine CJ, et al. Insights from the NHLBI-sponsored Women's Ishemic Syndrome Evaluation (WISE) study: part I: Gender differences in traditional and novel risk factors, symptom evaluation and gender-optimazed diagnostic strategies. J Am Coll Cardio. 2006;47(3 Suppl S):S4-20.

8. Šikić Vagić J. Psihosocijalne karakteristike kao čimbenici rizika u hospitaliziranih koronarnih bolesnika u Hrvatskoj (disertacija). Medicinski fakultet Sveučilišta u Zagrebu. Zagreb, 2010.

9. Chaitman BR, Bourassa MG, Davis K, et al. Angiographic prevalence of high-risk coronary artery disease in patients subsets (CASS). Circulation. 1981;64(2):360-7.

10. Jong PH, Sternberg L. Assessing coronary artery disease in women. Medscape Womens Health. 1998; 3(3):1.

11. Sullivan AK, Holdright DR, Wright CA, Sparrow JL, Cunningham D, Fox KM. Chest pain in women: clinical, investigative and prognostic features. BMJ. 1994;308(6933):883-6.

12. Stramba-Biadiale M, Fox KM, Priori SG, et al. Cardiovascular disease in women: a statement from the policy conference of the European Society of Cardiology. Eur Heart J. 2006;27(8):994-1005.

13. Lampert R, McPherson CA, Clancy JF, Caulin-Glaser TL, Rosenfeld LE, W.P. Batsford WP. Gender differences in ventricular arrhythmia recurrence in patients with coronary artery disease and implantable cardioverter-defibrillators. J Am Coll Cardiol. 2004;43:2293-9.

14. Shaw LJ, Shaw RE, Radford M, et al; ACC-National Cardiovascular Data Registry. Sex and ethnic differences in the prevalence of significant and severe coronary artery disease in the ACC-National Cardiovascular Data registry. Circulation. 2004;110:SIII800.

15. Hochman JS, Tamis JE, Thompson TD, et al; Global Use of Strategies to Open Occluded Coronary Arteries in Acute Coronary Syndromes IIb Investigators. Sex, clinical presentation, and outcome in patients with acute coronary syndromes. N Engl J Med. 1999;341:226-32.

16. Bairey Merz CN, Shaw LJ, Reis SE, et al; WISE Investigators. Insights From the NHLBI-Sponsored Women's Ischemia Syndrome Evaluation (WISE) Study Part II: Gender Differences in Presentation, Diagnosis, and Outcome With Regard to Gender-Based Pathophysiology of Atherosclerosis and Macrovascular and Microvascular Coronary Disease. J Am Coll Cardiol. 2006;47(3 Suppl):S21-9.

17. Nabel EG, Selker HP, Califf RM et al; National Heart, Lung and Blood Institute; American College of Cardiology Foundation. Women's Ischemic Syndrome Evaluation: current status and future research directions: report of the National Heart, Lung and Blood Institute workshop: October 2-4, 2002: section 3: diagnosis and treatment of acute cardiac ischemia: gender issues. Circulation. 2004;109:e50-e52.

18. Merz NB, Johnson BD, Kelsey PSF, et al. Wise Study Group. Women's Ischemia Syndrome Evaluation.. Diagnostic, prognostic, and cost assessment of coronary artery disease in women. Am J Manag Care. 2001;7(10):959-65.

19. Lerner DJ, Kannel WB. Patterns of coronary heart disease morbidity and mortality in the sexes: a 26-year follow-up of the Framingham population. Am Heart J. 1986;111(2):383-90.

20. Džono-Boban A, Šogorić S, Vuletić S. Regional variations and trends in mortality from cardiovascular diseases in population aged 0-64 in Dalmatia and Slavonia, 1998-2009. Coll Antropol. 2012;36 Suppl 1:235-9.

21. Vražić H, Šikić J, Lucijanić T, et al. The prevalence of overweight and obesity among Croatian hospitalized coronary heart disease patients. Coll Antropol. 2012;36 Suppl 1:211-6.

22. Ivanuša M, Miličić D, Božikov J, Ivanuša Z. [Risk factors as prognostic factors of hospital mortality in patients with acute myocardial infarction]. Acta Med Croatica. 2007;61(3):307-13.

23. Stock EO, Redberg R. Cardiovascular disease in women. Curr Probl Cardiol. 2012;37(11):450-526.

24. Yan LL, Daviglus ML, Liu K, et al. Midlife body mass index and hospitalization and mortality in older age. JAMA. 2006;11;295(2):190-8.

25. Canoy D, Cairns BJ, Balkwill A, et al; Million Women Study Collaborators. Body mass index and incident coronary heart disease in women: a population-based prospective study. BMC Med. 2013 Apr 2;11:87.