POSTERSKE SEKCIJE

POSTER SESSIONS

A
KARDIOVASKULARNA OBOLJENJA I SRČANI MARKERI

CARDIOVASCULAR DISEASES AND CARDIAC MARKERS

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Posterske sekcije
Poster sessions

A1

UTICAJ FIBRINOGENA NA LUMINALNO SUŽENJE KORONARNIH KRVNIH SUDOVA KOD PACIJENATA SA KORONARNOM ARTERIJSKOM BOLEŠĆU

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Ateroskleroza nastaje kao posledica poremećaja u metabolizmu lipida i lipoproteina. Međutim, promene u njihovoj koncentraciji nisu jedini faktori rizika koji će učestvovati u razvoju aterosklerotskih lezija. Više prospektivnih studija je pokazalo da je visoka koncentracija fibrinogena povezana s rizikom od razvoja koronarne vaskularne bolesti. Posmatrana je veza između koncentracije fibrinogena i stenoze veće od 50% na koronarnim krvnim sudovima kod 177 pacijeta sa kliničkim simptomima kardiovaskularnih bolesti. Koncentracije ukupanog holesterola, HDL-holesterola i triglicerida su merene enzimskim testom, a Friedewald-ovom jednačinom su dobijene vrednosti za LDL-holesterol. Koncentracije visoko osetljivog C-reaktivnog proteina (hsCRP) i lipoproteina(a) su određivane nefelometrijski. Plazma sa citratom je korišćena za merenje fibrinogena po Clauss-u. Za poređenje grupa koje su definisane tercilima fibrinogena korišćen je ANOVA test, a poređenje grupa definisanih najnižim i najvišim tercilima fibrinogena izvršeno je Sudent-ovim t testom. Pošto se distribucije hsCRP-a, lipoproteina (a) i triglicerida nisu vladale po Gaussu za poređenje su korišćene njihove logaritamski transformisane vrednosti. Pacijenti u grupi koja je definisana najvišim tercilom fibrinogena bili su značajno stariji u odnosu na pacijente sa najnižim tercilom fibrinogena (p=0,01). Broj pacijenata sa stenozom većom od 50% nije se značajno razlikovao između posmatranih grupa (Chi square test, p = 0,205). Grupa pacijenata sa vrednostima fibrinogena višim od granice za treći tercil ima za 1,7 puta veći rizik od pojave značajne stenoze od pacijenata sa

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EFFECTS OF FIBRINOGEN ON INTERNAL LUMINAL NARROWING OF CORONARY ATRERIES IN PATIENTS WITH CORONARY ARTERY DISEASE

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Atherosclerosis is considered to be primarily a disorder of lipid and lipoprotein metabolism. Lipid levels should not be only risk factor to take into account in the development of atherosclerotic plaque. Evidence has accumulated from several prospective studies that high plasma fibrinogen concentrations were associated with elevated risk of coronary vascular disease. The association between plasma fibrinogen and the presence of significant stenosis (internal luminal narrowing of more than 50% was considered significant) was determined in 177 patients with clinical symptoms of cardiovascular disease. Total blood cholesterol, high density cholesterol and plasma triglygliceride levels were measured by classic enzymatic method. Low density cholesterol concentrations was calculated by Friedewald's formula. High-sensitivity C-reactive protein (hsCRP), as well as lipoprotein(a) levels, were measured by nephelometry. Citrated plated-poor plasma was used to measure plasma fibrinogen by Clauss' method. Comparison of risk factors between groups defined by tertile of fibrinogen were made by ANOVA, and comparison between first and third tertiles were made by the Student's t test for continues variables. Because the distribution of hsCRP, lipoprotein(a) and triglyceride values were skewed, a logarithm transformation was applied for comparison. Age was higher for subjects in the upper than in the lower tertile for fibrinogen (P=0.01). The number of subjects with significant stenosis was higher in upper (32%) than in lower (28%) tertile of fibrinogen, but without statistically significance (Chi square test, P=0.205). The unad-

najnižim vrednostima fibrinogena (*unadjusted odds ratios* = 1,7; 95% CI, 0,77 do 3,75). Na osnovu dobijenih rezultata vidi se da je formiranje lezije u koronarnim krvnim sudovima delimično posledica direktnog uticaja povišene koncentracije fibrinogena.

justed odds ratios for significant stenosis in subjects with fibrinogen levels in the upper tertile compared with the lower tertile was 1.7 (95% CI, 0.77 to 3.75). These findings suggest that arterial lesions are partially a direct consequence of increased fibrinogen level.

A2

UTICAJ FIZIČKE AKTIVNOSTI I STAROSTI NA KONCENTRACIJE FIBRINOGENA I C-REAKTIVNOG PROTEINA U PLAZMI ZDRAVIH ŽENA

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Povećane koncentracije fibrinogena i C-reaktivnog proteina (CRP) u plazmi smatraju se jednim od faktora rizika za razvoj kardiovaskularnih bolesti. Takođe, danas je poznato da su fibrinogen i CRP povezani i sa tradicionalnim kardiovaskularnim faktorima rizika. Prvenstvena namera u ovom radu je bila da se ispita da li, i na koji način fizička aktivnost utiče na promene u koncentraciji fibrinogena i CRP koje su uslovljene starenjem. Koncentracije fibrinogena i CRP su određivane u plazmi 29 zdravih premenopauzalnih žena: 19 fizički neaktivnih (Pre-N) i 10 fizički aktivnih (Pre-FA), i 53 zdravih postmenopauzalnih žena: 19 fizički neaktivnih (Post-N) i 34 fizički aktivnih (Post-FA). Takođe su određivani i nivoi drugih tradicionalnih kardiovaskularnih faktora rizika (težina, indeks telesne mase BMI, sistolni i dijastolni pritisak, ukupni holesterol, HDL-holesterol, LDL-holesterol i trigliceridi). Rezultati dobijeni primenom Student t-testa pokazuju da nema statistički značajne razlike ni za jedan od pomenutih parametara kada se uporede Pre-N i Pre-FA grupa, ali da postoji značajna razlika u BMI, sistolnom i dijastolnom pritisku i koncentraciji ukupnog holesterola između Post-N i Post-FA grupe. Kod ove dve postmenopauzalne grupe uočeni su značajno veći nivoi sistolnog i dijastolnog pritiska i koncentracije ukupnog i LDL-holesterola u odnosu na odgovarajuće premenopauzalne grupe. Koncentracija CRP bila je značajno veća u Post-N grupi u odnosu na Pre-N ($p<0,05$), dok nije bilo značajne razlike u koncentraciji CRP između Post-FA i Pre-FA ($p=0,19$). S druge strane, nije nađena značajna razlika u koncentraciji fibrinogena između Post-N i Pre-N grupe, dok je u Post-FA grupi izmerena značajno veća koncentracija fibrinogena u odnosu na Pre-FA

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EFFECT OF PHYSICAL ACTIVITY AND AGE ON PLASMA FIBRINOGEN AND C-REACTIVE PROTEIN LEVELS IN HEALTHY WOMEN

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Increased plasma fibrinogen and C-reactive protein (CRP) levels have been identified as risk factors of cardiovascular diseases. It is also known that fibrinogen and CRP are associated with traditional cardiovascular risk factors. Our primary intention was to explore whether and how physical activity exert influence on age-related changes in CRP and fibrinogen concentrations in a population of healthy women. Levels of plasma fibrinogen and CRP were measured in 29 healthy premenopausal women: 19 sedentary (Pre-S) and 10 physically active (Pre-PA) and in 53 healthy postmenopausal women: 19 sedentary (Post-S) and 34 physically active (Post-PA). We also measured levels of other cardiovascular risk factors (weight, BMI, systolic and diastolic pressure, total cholesterol, HDL and LDL cholesterol and triglycerides). Results obtained by using Student's t-test have shown that there was no significant difference for any of mentioned parameters between Pre-S and Pre-PA groups, but that there was a statistically significant difference in BMI, systolic heart pressure and total cholesterol levels between Post-S and Post-PA groups. Post-S and Post-PA groups had significantly higher levels of systolic and diastolic pressure, total and LDL cholesterol than their physically active matched premenopausal counterparts. CRP levels were significantly higher in Post-S comparing to Pre-S group ($P<0.05$), and in Post-PA group there was no significant difference in CRP levels comparing to Pre-PA group ($P=0.19$). On the other hand, there was no difference in fibrinogen concentrations between Post-S and Pre-S groups, but fibrinogen level was significantly higher in Post-PA than in Pre-PA group (4.47 ± 1.04 vs 3.65 ± 0.70 g/L). Multiple stepwise regres-

(4,47 ± 1,04 vs 3,65 ± 0,70). Multipla regresiona analiza ukupnog uzorka pokazala je da su starost, BMI, LDL-holesterol i fibrinogen u nezavisnoj korelaciji sa koncentracijom CRP u plazmi. Istim statističkim postupkom je utvrđeno da fizička aktivnost ima zaštitni efekat na nivo fibrinogena (BETA = –0,2632). Ovaj rad je potvrdio da fizička aktivnost i godine starosti utiču na koncentraciju CRP, dok je povećana fizička aktivnost u direktnoj korelaciji sa sniženom koncentracijom fibrinogena u krvi.

sion analysis revealed that age, BMI, LDL cholesterol and fibrinogen were in independent correlation with plasma CRP concentration in the overall study population. The same analysis has shown that physical activity had protective effect on fibrinogen levels (BETA = –0.2632). This study confirmed that physical activity and age have certain influent on CRP levels, and that physical activity is associated with lower fibrinogen blood concentrations.

A3

ZNAČAJ ODREĐIVANJA MIOGLOBINA U DIJAGNOZI INFARKTA MIOKARDA

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Oštećenje ćelija za vreme infarkta miokarda u toku nekoliko sati dovodi do oslobađanja mioglobina (My) u cirkulaciju. Mioglobin se kao mala molekula vrlo brzo eliminiše urinom. U ovom radu određivane su vrednosti My u serumu kod 42 bolesnika kojima je urađena operacija aorto koronarni »bypass« pre operacije, 4 i 16 sati posle skidanja kleme sa aorte. Isto tako određivani su i drugi markeri oštećenja srčanog mišića, kreatin kinaza (CK) i njen izoenzim MB (CK-MB). Da bi se procenjivala dijagnostička vrednost određivanih parametara dobijene koncentracije su posmatrane prema vrednostima koje su određene u serumima bolesnika sa ortopedskim operacijama. My je određivan Randox-ovim testom na Behring-ovom ELISA Procesoru II. CK i CK-MB su određivani Randox-ovim testovima na Synhron CX5 analizatoru. Od 42 bolesnika, 6 je imalo perioperativni akutni infarkt miokarda. Rezultati su pokazali da je 4 sata posle skidanja kleme sa aorte dijagnostička osetljivost My (0,83) bila viša od dijagnostičke osetljivosti enzima CK (0,67) i izoenzima CK-MB (0,67). Dijagnostičke osetljivosti My (1,00) i izoenzima CK-MB (1,00) 16 sati posle skidanja kleme sa aorte bile su više od dijagnostičke osetljivosti CK (0,5). Dobijeni rezultati su pokazali da je My značajan kao rani marker oštećenja srčanog mišića. Zahvaljujući brzoj eliminaciji My je veoma značajan za dijagnozu re-infarkta miokarda.

A3

IMPORTANCE OF MYOGLOBIN MEASUREMENTS IN DIAGNOSIS OF MYOCARDIAL INFARCTION

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Cell damage during myocardial infarction in a few-hour period provokes release of myoglobin in the circulation. As a small molecule, myoglobin is quickly excreted in the urine. In this study we measured myoglobin (My) serum values in 42 patients in whom coronary artery bypass grafting was performed before operation, and 4 and 16 hours after aortic clamp removal. We also determined other heart muscle damage markers – creatine kinase (CK) and its isoenzyme MB (CK-MB). In order to assess diagnostic value of specified parameters, the obtained concentrations were assessed according to values measured in sera of orthopaedic surgery patients. Myoglobin was measured using Randox test with Behring ELISA Procesor II. CK and CK-MB were measured using Randox test with Synhron CX5 analyzer. Six patients of 42 suffered perioperative acute myocardial infarction. Results showed that 4 hours after removal of aortic clamp, diagnostic sensitivity of My (0.83) was higher than diagnostic sensitivity of CK enzyme (0.67) and CK-MB isoenzyme (0.67). Sixteen hours after aortic clamp removal, diagnostic sensitivity of My (1.00) and diagnostic sensitivity of CK-MB enzyme (1.00) were higher than that of CK (0.5). The obtained results point to the great importance of My as an early marker of heart muscle damage. Because of its short half-life in the circulation My is important for diagnosis of myocardial re-infarction.

A4

PROTEINI AKUTNE FAZE KAO SRČANI MARKERI

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Pri proceni bolesti srca i krvnih sudova, pored uobičajenih biohemijskih parametara, određuju se i proteini akutne faze kao markeri inflamacije. Cilj ovog rada bio je da se ocijeni značaj određivanja CRP-a i fibrinogena kod akutnog infarkta miokarda u poređenju sa tradicionalnim srčanim markerima. Obrađeno je 38 pacijenata sa akutnim infarktom miokarda prvog dana bolesti, bez drugih komplikacija i 50 zdravih muškaraca 45–55 godina starosti. Svim pacijentima su određeni specifični enzimi, lipidi i lipoproteini, CRP, fibrinogen i drugi parametri. Međutim, ovde su prikazani samo najvažniji. Srednje vrijednosti enzima (Kv i statistička značajnost) u poređenju sa kontrolnom grupom su: CK = 1986 U/L (Kv = 80,3%, p<0,001); CK-MB = 128,4 U/L (Kv = 61,1% i p<0,01); AST = 202,7 U/L (Kv = 59% i p<0,001). Zaštitni lipoproteini u kontrolnoj grupi su: HDL (mmol/L) = 1,31 ± 0,35; HDL_2 (mmol/L) = 0,41 ± 0,16 i HDL_3 (mmol/L) = 0,9 ± 0,25, a u grupi pacijenata HDL (mmol/L) = 1,07 ± 0,29 (p<0,05); HDL_2 (mmol/L) = 0,3 ± 0,13 (p<0,01) i HDL_3 (mmol/L) = 0,77 ± 0,18 (p<0,01). Pacijenti su imali srednje vrijednosti CRP-a 69,2 mg/L sa Kv 107%, a kontrolna grupa 5,7 ± 1,88 sa Kv 33%, što se međusobno značajno statistički razlikuje p<0,001. Fibrinogen je kod bolesnika iznosio 5,41 (g/L) ± 0,825 sa Kv 15,2%, kontrolna grupa imala je srednje vrijednosti 3,17 (g/L) ± 0,43 sa Kv 13,6% što je statistički značajna razlika p<0,01. CRP je određivan imunoturbidimetrijskom metodom, CK-MB metodom imunoinhibicije, za AST i CK je mjerena enzimska aktivnost, HDL holesterol i subfrakcije su određivane enzimskim testom u supernatantu, poslije selektivnog taloženja polietilenglikolom. Sva mjerenja su vršena na Beckman-ovom biohemijskom analizatoru Synchron CX-9. Fibrinogen je određivan Behring-ovim testom na Sysmex-u CA 1500. Upoređujući CRP sa ostalim parametrima dobijena je najbolja korelacija sa CK-MB (t=1,82 i p<0,05), pa se ovaj protein akutne faze može smatrati zadovoljavajućim srčanim markerom uz enzime koje smo odredili i koji se primenjuju u svakodnevnoj kliničkoj praksi.

A4

ACUTE PHASE PROTEINS AS CARDIAC MARKERS

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In addition to usual biochemical parameters in coronary and blood vessel also the acute phase protein as a marker of inflammation is determined. The aim of this paper is to estimate the importance of determining CRP and fibrinogen in patients with acute myocardial infarction (AIM) in comparison with traditional cardiac markers. We examined 38 patients with an acute myocardial infarction in the first day of illness, without complication, and 50 healthy males of the same age (45–55 years). We determined all specific enzymes, lipids and lipoproteins, CRP and other parameters. However we present here the most important. The mean values of enzymes and their statistical significance compared with control group are: CK = 1986 U/L (CV = 80.3%, P<0.001); CK-MB= 128.4 U/L (CV=61.1%, P<0.01); AST=202.7 U/L (CV=59%, P<0.001). Protective lipoptroteins in control group: HDL (mmol/L)=1.31 ± 0.35; HDL_2 (mmol/L)=0.41 ± 0.16 and HDL_3 (mmol/L)= 0.9 ± 0.25, in patients: HDL (mmol/L)=1.07 ± 0.29 (P<0.05); HDL_2 (mmol/L)=0.3 ± 0.13 (P<0.01) and HDL_3 (mmol/L)=0.77 ± 0.18 (P<0.01). Mean CRP value in patients was 69.2 mg/L with CV 107%, control group 5.7 ± 1.88 with CV 33%, with a statistically significant difference of P<0.01. Fibrinogen in patients is 5.41 (g/L) ± 0.825 with CV 15.2%, and mean values in control group are 3.17(g/L) ± 0.43 with CV 13.6% which is a statistically a significant difference, P<0.01. CRP was determined by immunoturbidimetric method, CK-MB by method of immunoinhibition, AST and CK by measuring enzymes activity, HDL cholesterol and subfractions were determined by enzymes test in supernatant, after selective precipitation of polyethylenglicole. Measurings were done on Beckman Synchron CX-9. Fibrinogen is determined by Behring's test on the Sysmex CA 1500. Comparing CRP with other parameters we obtained the best correlation with CK-MB (t=1.82 i P<0.05), Therefore CRP can be considered as a satisfactory cardiac marker together with other determined enzymes performed in routine clinical practice.

A5

SRČANI TROPONIN T I C-REAKTIVNI PROTEIN VISOKE OSETLJIVOSTI KAO MARKERI LOŠE PROGNOZE U PACIJENATA NA HEMODIJALIZI

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Određivanje srčanog troponina T (cTnT) je značajno za dijagnozu i praćenje pacijenata s akutnim koronarnim sindromom (AKS); C-reaktivni protein visoke osetljivosti (CRP hs) je reaktant akutne faze koji reflektuje zapaljenski proces niskog stepena i proučava se kod različitih kardiovaskularnih oboljenja. cTnT se primenjuje u kliničkoj praksi više od deset godina, međutim ovaj marker je teško objasniti u pacijenata na hemodijalizi (HD), zbog čestog dobijanja povišenih vrenosti u odsustvu dijagnostikovanog AKS. Obavljena su mnoga ispitivanja kako bi se utvrdio značaj povišenih vrednosti cTnT-a i CRP-a u pacijenata na HD koji se smatraju kao faktori loše prognoze. Cilj ovog rada je bio da se proceni prognostički značaj određivanja cTnT i CRP hs u pacijenata na hemodijalizi u našoj bolnici. Koncentracije cTnT-a i CRP hs su određivane u uzorcima seruma 37 pacijenta prosečne starosti 53 godine pri rutinskoj kontroli pre dijalize u martu 2003. godine. Koncentracija cTnT je određivana metodom elektrohemiluminiscencije (Elecsys 2010, Roche®), a CRP hs nefelometrijski (Behring Nephelometer 100®). Jedanaest meseci kasnije upoređene su vrednosti cTnT i CRP hs koje su dobijene u serumu bolesnika koji su preživeli i u grupi umrlih. Dobijeni su sledeći rezultati: umrlih pacijenata: 9, preživelih 28; koncentracija cTnT (μg/L) izražena kao srednja vrednost sa najnižom i najvišom vrednošću u preživelih je 0,077 (0,013–0,71), a u grupi umrlih je 0,173 (0,035–2,353). Jedanaest (39%) pacijenata koji su preživeli boluje od nekog srčanog oboljenja, u odnosu na 78% (7) u grupi pacijenata koji su umrli. Ishemijska srčana oboljenja su prisutna u 25 % (7) u grupi preživelih i 33% (3) u grupi umrlih. U svih pacijenata koji su imali povišene vrednosti cTnT, bile su povišene i vrednosti CRP hs (mg/L) 7,91 (4,39– 10,55). Dobijeni rezultati potvrđuju značaj povišenih vrednosti cTnT I CRP hs kao faktora loše prognoze u pacijenata na hemodijalizi. Ovim pacijentima treba određivati cTnT i CRP hs u redovnoj rutinskoj kontroli kako bi se poboljšalo praćenje nihovog stanja.

A5

CARDIAC TROPONIN T AND HIGHLY SENSITIVE C-REACTIVE PROTEIN AS PROGNOSTIC MARKER OF DEATH IN PATIENTS ON HAEMODIALYSIS

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Determination of cardiac troponin T (cTnT) is very important in establishing the diagnosis and observation of patients with acute coronary syndrome (ACS); C-reactive protein of high sensitivity (CRP hs), an acute phase reactant which reflects the inflammatory process of low intensity, is studied in patients with various cardiovascular diseases. cTnT is used in clinical practice for more than 10 years. However, due to the frequent finding of its high values in the absence of verified ACS, the important role of this marker is difficult to evaluate in patients on haemodialysis (HD). There are many published results on the importance of increased cTnT and CRP hs values in patients on HD considered as factors of poor prognosis. The aim of the study was to evaluate prognostic importance of cTnT and CRP hs in patients on HD. The concentrations of cTnT and CRP hs were determined in sera of 37 patients on haemodialysis in the Military Medical Academy, mean age 53 years, during routine contol before HD starting from March 2003. cTnT concentration was determined by electrochemiluminescence method (Elecsys 2010, Roche®), and CRP hs by nephelometry (Behring nephelometar 100®). Eleven months later, the initially found results of cTnT and CRP hs values were compared between survived and died patients. Concentration of cTnT expressed as μg/L, with the mean, lowest and highest values in survived patients (N = 28) were 0.077 (0.013 –0.71), and in died patients (N = 9) 0.173 (0.035–2.353), with the values between the groups being statistically highly significant. Thirty nine percent (11) of patients among survived had some kind of heart disease, in relation to 78% (7) in the group of those who died. Ischaemic heart disease was present in 25% (7) in group of survived and in 33% (3) in group of died persons. In all patients with an increased level of cTnT, the values of CRP hs (mg/L) were also increased: 7.91 (4.39– 10.55). Our results speak in favour of the importante role of increased levels of cTnT and CRP hs as factors of poor prognosis in patients on haemodialysis. Therefore, in order to improve the control of their state, routine control examination of cTnT and CRP hs is suggested in these patients.

A6

ZNAČAJ ODREĐIVANJA SRČANIH MARKERA U AKUTNOM KORONARNOM SINDROMU

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Akutni koronarni sindrom (ACS) je česta radna dijagnoza u urgentnoj medicini, a naročito u kardiologiji. Određivanje srčanih markera je posebno značajno u nestabilnoj angini pektoris (NAP) i non Q infarktu (NQMI) kada EKG promene nisu karakteristične. Cilj rada je bio određivanje dijagnostičkog i prognostičkog značaja srčanih markera u ACS-u. Ispitano je 32 pacijenta sa ACS-om, prosečne starosti 59,4 godine, oba pola. Pored iscrpne anamneze, pregleda, EKG-a, osnovnih laboratorijskih analiza, određivani su i sledeći srčani markeri: CK, CK-MB, AST, alfa-HBDH, LDH (enzimskim kinetičkim metodama), mioglobin i troponin-T (imunološkim testovima). Markeri su određivani na prijemu i 2, 4, 6, 8, 12 i 24 sata nakon početka bola. Mioglobin dostiže visoku negativnu prediktivnu vrednost (NPV) u ranim satima posle ACS-a. Troponin-T nije rani marker za isključivanje ACS-a i njegova NPV se menjala tokom vremena, zajedno sa porastom aktivnosti CK-MB, dostižući maksimum od 8 do 12. sata nakon početka simptoma. Osetljivost brzog testa za troponin-T se povećavala od 33% unutar 2 sata nakon početka bola u grudima do 96% nakon 8 sati. CK-MB i Tn-T su najspecifičniji markeri u ACS-u. Za praćenje srčanih markera potrebno je serijsko uzimanje krvi. Skoro polovina pacijenata sa NAP imala je povišene vrednosti Tn-T (0,22 ± 0,08 ng/mL). Pacijenti sa NQMI imali su povišene vrednosti Tn-T u 78% (0,48 ± 0,16 ng/mL). Brzo određivanje Tn-T i mioglobina je korisno za ranu trijažu pacijenata sa ACS-om, naročito sa NAP i NQMI. Troponin-T i CK-MB pokazuju najveću specifičnost. Pacijenti sa pozitivnim nalazom Tn-T imaju veliki rizik za novi koronarni događaj.

A6

IMPORTANCE OF HEART MARKERS IN ACUTE CORONARY SYNDROME

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Acute coronary syndrome (ACS) is often diagnosed in urgent medicine, especially in cardiology. Determination of cardiac markers is very important in nonstable angina pectoris (NAP) and non Q infarction (NQMI) when ECG changes are not typical. The aim of the study was to determine the diagnostic and prognostic importance of heart markers in ACS. Thirty two patients with ACS, average age 59.4 years, of both sexes were examined. Besides a detailed medical history, examinations, ECG, laboratory analyses, the following cardiac markers were determined: CK, CK-MB, AST, alfa-HBDH, LDH (enzyme kinetic methods), myoglobin and troponin-T (immunologic tests). Markers were determined at admission and 2, 4, 6, 8, 12 and 24 hours after the onset of the pain. Myoglobin had a high negative predicative value (NPV) in early hours after ACS. Troponin-T was not an early marker for excluding ACS and its NPV has been changing during the time together with the increased CK-MB activity, reaching its maximum from 8 to 12 hours after the onset of the symptoms. Sensitivity of the fast assay for troponin-T was increased from 33% within 2 hours after the beginning of chest pain to 96% after 8 hours. CK-MB and Tn-T are the most specific markers in ACS. A serial taking of blood is necessary for monitoring of heart markers. In almost half of the patients with NAP high values of Tn-T (0.22 ± 0.8 ng/mL). Patients with NQMI had increased values of Tn-T in 78% of cases (0.48 ± 0.16 ng/mL). The fast determination of troponin-T and myoglobin is useful for early triage of patients with ACS, especially with NAP and NQMI. Troponin-T and CK-MB showed the greatest specificity. Patients with positive findings of Tn-T have a great risk of new coronary occurings.

A7

NIVO C-REAKTIVNOG PROTEINA KOD ŽENA SA KORONARNIM RIZIKOM

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C-reaktivni protein (CRP) je marker akutne faze koji se koristi u detekciji i predviđanju ishoda različitih infektivnih, inflamatornih i nekrotičnih procesa. S obzi-

A7

LEVEL OF C-REACTIVE PROTEIN IN WOMEN AT CORONARY RISK

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C-reactive protein (CRP) is a marker of an acute phase and is used to detect and predict outcomes of different infectious, inflammatory and necrotic pro-

rom da je aterotromboza hronični inflamatorni proces, visina CRP može da predvidi nastanak infarkta miokarda, moždanog udara, perifernih arterijskih oboljenja i iznenadnu srčanu smrt kod naizgled zdravih ljudi. Cilj rada je bio da se ispita nivo CRP kao inflamatornog biomarkera za prognozu kardiovaskularnih događaja kod žena sa koronarnim rizikom koje imaju poremećen lipidni status. Ispitano je 36 žena sa hiperlipoproteinemijom, prosečne životne dobi 54,8 godina. Kod svih žena određivan je nivo estrogena u serumu 14-og dana menstrualnog ciklusa ELISA metodom i CRP turbidimetrijskom metodom. Od parametara lipidnog statusa određivani su holesterol, trigliceridi, HDL-holesterol, a izračunat je LDL-holesterol i faktori rizika. Rezultati pokazuju da je nivo estrogena u ispitivanoj grupi bio dva puta niži nego u kontrolnoj grupi, što je i statistički značajno. Značajno je viši t za HDL-holesterol i aterogene rizike, u čiji račun ulazi HDL-holesterol, u odnosu na ostale parametre lipidnog statusa. Prema nivou CRP koji je povećan u 86,2% ispitanica, žene su podeljene u 3 grupe. Prvu grupu čine žene sa niskim rizikom gde je CRP < 1 mg/L (13,8%), drugu sa srednjim rizikom gde je CRP < 3 mg/L (19,4%), a treću grupu ispitanice sa visokim rizikom gde je CRP > 3 mg/L (66%). Ukupno preživljavanje bilo je najgore kod onih sa povišenim CRP i LDL-holesterolom (22%), a najbolje kod onih kod kojih su oba ova parametra snižena. Žene sa povećanim CRP, a niskim LDL-holesterolom (19,4%) su pod većim vaskularnim rizikom u poređenju sa onima kod kojih je povišen LDL-holesterol, a nizak CRP (8,3%). Nije nađena korelacija vrednosti HDL-holesterola i CRP, dok postoji minimalna korelacija CRP i LDL-holesterola. Na osnovu nađenog preporučuje se kombinovano određivanje CRP i LDL-holesterola za bolju detekciju koronarnog rizika.

cesses. Since, atherothrombosis is a chronic inflammatory process, the value of CRP can predict myocardial infarction, stroke, peripheric artery diseases as well as sudden cardiac death in persons apparently in good health. The aim of this paper is to examine the level of CRP as of an inflammatory biomarker for predicting cardiovascular events in women with coronary risk and a with disordered lipid status. Thirty six women with hyperlipoproteinaemia, average age 54.8 years, were examined. Serum level of oestrogen was determined on 14th day of menstruation cycle by means of ELISA method and CRP turbidimetric method. The following parameters of lipid status were determined: cholesterol, triglycerides, HDL-cholesterol; LDL-cholesterol and risk factors were also estimated. Results show that the level of oestrogen in tested group is two times lower that in control group. This finding is statistically significant. Significantly increased is t for HDL-cholesterol and atherogenic risk as well as HDL-cholesterol in comparison to all other parameters of lipid status. On the basis of increased to the level of CRP, (86.2%) the tested women, are divided into 3 groups. The first group included women with low risk, where CRP is < 1 mg/L (13.8%), the second group consisted of women with median risk, where CRP is < 3 mg/L (19.4%); and the third group is composed of women with high risk, where CRP is > 3 mg/L (66%). The total survival is the worst in patients with increased CRP and LDL-cholesterol levels, (22%) and the best in patients in whom both parameters are low. Women with increased CRP and low LDL-cholesterol levels (19.4%) are under high vascular risk in comparison with those with increased LDL-cholesterol and low CRP levels (8.3%). The correlation of HDL-cholesterol and CRP values was not found. Therefore, a combined determination of CRP and LDL-cholesterol levels is recommended in order to better detect a coronary risk.

A8

AKTIVNOST ENZIMA SUPEROKSID DISMUTAZE U ERITROCITIMA PACIJENATA SA ANGIOGRAFSKI DOKAZANOM KORONARNOM ARTERIJSKOM BOLEŠĆU

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Slobodni radikali i antioksidativna zaštita se danas intenzivno izučavaju u medicinskoj biohemiji i u okviru kliničkih studija. Danas se koristi više metoda i načina za procenu oksidativnih/antioksidativnih parametara u cilju boljeg razumevanja osnovnih patofizioloških mehanizama različitih bolesti. U ovom radu je istraživan

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ACTIVITY OF SUPEROXIDE DISMUTASE ENZYME IN ERYTHROCYTES OF ANGIOGRAPHICALLY ASSESSED CORONARY ARTERY DISEASE PATIENTS

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Free radicals and antioxidative defense system are intensively studied in biochemistry and in clinical studies. There are many methods for evaluation of oxidative/antioxidative parameters, and all of them are developed in order to obtain a better understanding of pathophysiological mechanisms of different diseases.

antioksidativni potencijal enzima superoksid dismutaze (SOD; EC 1.15.1.1) u eritrocitima kardiovaskularnih pacijenata sa angiografski utvrđenim stepenom okluzije koronarnih arterija. Aktivnost SOD je određivana modifikovanom Misra-Fridovich metodom. Ova spektrofotometrijska metoda se zasniva na sposobnosti SOD da inhibira autooksidaciju epinefrina u alkalnoj sredini pH=10,4. Ispitanici su bili podeljeni u dve grupe i to: grupu koronarnih pacijenata (CAD grupa, n=135) i grupu zdravih ispitanika (C grupa, n=197). Aktivnost enzima SOD je bila značajno niža u grupi pacijenata nego u kontrolnoj grupi ($\bar{x}$ = 21,54 U/mg Hb vs. 24,33 U/mg Hb; p< 0,01). Nije nađena korelacija između aktivnosti ovog antioksidativnog enzima u eritrocitima i u plazmi. Razlika u aktivnosti SOD u eritrocitima podgrupa pacijenata podeljenih po stepenu okluzije koronarnih krvnih sudova (0 – bez okluzije, 1 – stenoza jednog krvnog suda, 2 – stenoza dva krvna suda, 3 – stenoza tri krvna suda) nije bila statistički značajna. Rezultati su pokazali da se ovi bolesnici nalaze u stanju hroničnog oksidativnog stresa i da je njihov antioksidativni sistem iscrpljen, te su stoga vrednosti SOD snižene u odnosu na kontrolnu grupu. S obzirom na to da SOD štiti srčani mišić od oštećenja u procesima ishemije i reperfuzije određivanje i praćenje aktivnosti ovog enzima može biti korisno u u dijagnostici i terapiji kardiovaskularnih pacijenata.

The aim of this study was to estimate antioxidative potential of superoxide dismutase (SOD; EC 1.15.1.1) in erythrocytes of cardiovascular patients with coronarographically assessed coronary artery disease. Activity of SOD was determinated using a slightly modified Misra-Fridovich method. This spectrophotometric method is based on SOD ability to inhibit epinephrine autooxidation in alkaline medium, pH=10.4. The examined group consisted of coronary artery disease patients (CAD, n=135) and apparently healthy people (group C, n=197). SOD activity was significantly lower in patients group a in healthy control group (21.54 U/mg Hb vs. 24.33 U/mg Hb; P<0.01). We found no correlation with plasma SOD activity. The difference in SOD activity between patients subgroups that were formed according to angiographical results (0 – without stenosis, 1 – one vessel disease, 2 – two vessels disease, 3 – three vessels disease) was not statistically significant. These results have shown that coronary artery disease patients are in chronic oxidative stress state, and their antioxidative defense system is exhausted, so erythrocyte SOD activities are diminished. It is well-known that SOD has a protective role in heart muscle damage in ischaemic/reperfusion processes, so we believe that the follow-up of SOD activity could be useful in diagnosis and treatment of cardiovascular patients.

A9

UTICAJ HIPERGLIKEMIJE NA VREDNOSTI ANTIOKSIDANTNIH ENZIMA, SOD I GPX U DIJABETIČARA TIPA 2 SA KORONARNOM BOLEŠĆU

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Kardiovaskularne bolesti (koronarna srčana bolest, infarkt miokarda i periferna vaskularna bolest) su najčešći i najvažniji uzrok morbiditeta i mortaliteta u pacijenata sa diabetes mellitusom tipa 2. Utvrđeno je postojanje uzročne veze između stanja hiperglikemije kod dijabetičara i pojave kardiovaskularnih komplikacija. Poznato je da dijabetičari pate od hronične hipoksije koja je posledica različitih faktora uključujući i produkciju slobodnih radikala. Prema teoriji »oksidativnog stresa« povećana produkcija slobodnih radikala je uključena i u sam nastanak dijabetesa. U ovom radu su određivani antioksidantni enzimi superoksid dismutaza

A9

EFFECT OF HYPERGLYCAEMIA ON VALUES OF ANTIOXIDATIVE ENZYMES, SOD AND GPX IN DIABETIC PATIENTS TYPE 2 WITH CORONARY ARTERY DISEASE

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Cardiovascular diseases (coronary artery disease, myocardial infarction and peripheral vascular disease) are the most frequent causes of morbidity and mortality in type 2 diabetic patients. The causuality of hyperglycaemia in diabetics and resulting cardiovascular complications were verified. It is well known that diabetics suffer from chronic hypoxia that is the result of different factors including the production of free radicals. According to theory of »oxidative stress«, the increased production of free radicals is involved in the developement of diabetes. Our study tested the antioxidative enzymes superoxide dismutase (SOD) and

(SOD) i glutation peroksidaza (GPX) kod dijabetičara tipa 2 sa i bez koronarne bolesti u funkciji glikemije kako bi se utvrdilo postojanje korelacije između nivoa glikemije i stepena poremećaja antioksidativnih parametara. Određivani su enzimi: superoksid dismutaza (SOD) i glutation peroksidaza (GPX) u eritrocitima kod 111 pacijenata obolelih od dijabetesa tipa 2; od toga 48 pacijenata je bilo bez komplikacija a 63 pacijenta sa koronarnom bolešću kao komplikacijom. Kontrolnu grupu je činilo 42 zdrava ispitanika. Kod svih ispitanika je određivana glikemija natašte. Statističkom obradom podataka dobijene su značajno niže vrednosti ispitivanih parametara kod dijabetičara sa komplikacijama, (SOD = 806,47 ± 103,58 U/gHb; GPX = 23,63 ± 4,55 U/gHb) u odnosu na diabetičare bez komplikacija (SOD = 961 ± 92,87 U/gHb, GPX = 27,18 ± 5,27 U/gHb), a takođe i u odnosu na zdrave ispitanike (SOD = 969,42 ± 104,8 U/gHb, GPX = 29,1 ± 3,52 U/gHb) ($p<0,05$). Dobijene vrednosti glikemija su bile u inverznoj korelaciji sa ispitanim parametrima antioksidativne zaštite, što potvrđuje hipotezu o uticaju hiperglikemije na povećanu produkciju slobodnih radikala i smanjenje antioksidativne zaštite.

glutathione peroxidase (GPX) in type 2 diabetic patients with and without coronary artery disease in function of glycaemia in order to establish the correlation between glycaemia level and extent of disorders of antioxidative parameters. The following enzymes were analyzed: SOD and GPX in red blood cells of 111 type 2 diabetic patients: of them, 48 had no complication, while 63 manifested coronary artery disease as a complication. Control group was composed of 42 healthy subjects. Fasting glucose levels were measured in all subjects. Statistical data processing yielded significantly lower values of tested parameters in type 2 diabetics with coronary artery disease (SOD = 806.47 ± 103.58 U/gHb; GPX = 23.63 ± 4.55 U/gHb) in relation to diabetics without complications (SOD = 961 ± 92.87 U/gHb; GPX = 27.18 ± 5.27 U/gHb), as well as in comparison to healthy subjects (SOD = 969.42 ± 104.8 U/gHb); GPX = 29.1 ± 3.52 U/gHb) ($P < 0.05$). The obtained glycaemia values were in the inverse correlation with tested parameters of antioxidative defence, confirming the initial hypothesis of the effect of hyperglycaemia on incresed production of free radicals and reduced antioxidative defence.

A10

UTICAJ EKSTRAKORPORALNE CIRKULACIJE NA NIVO DIGOKSINA U KRVI

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Na Klinici za kardiovaskularnu hirurgiju u Sremskoj Kamenici u neposrednom postoperativnom toku, pacijenti dobijaju udarne doze digoksina. S obzirom da je među operisanim pacijentima, grupa pacijenata koji su preoperativno bili na kardiotoničnoj terapiji uzimajući u obzir usku terapijsku širinu digoksina postoji mogućnost intoksikacije. Veliki broj naučnih radova ukazuje na kontraverzne podatke o sudbini digoksina u toku i posle hirurškog zahvata na otvorenom srcu uz pomoć ekstrakorporalne cirkulacije (ECC). U toku ECC dolazi do značajne hemodilucije u cirkulaciji i hipotermije organizma, a sa druge strane, digoksin kao lek sa velikim volumenom distribucije, može ostati u značajnoj koncentraciji u krvi nakon operativnog zahvata. U istraživanje je uključeno 47 pacijenata sa normalnom hepato-renalnom funkcijom čije su serumske vrednosti digoksina bile u terapeutskim granicama. Nivo digoksina je određivan pre ECC, neposredno posle ECC i nakon 7 dana. Uporedo su kontrolisane vrednosti hemoglobina i ukupnih proteina. Prosečna vrednost digoksina pre ECC je bila 1,37 ng/mL, nakon ECC-a 1,07 ng/mL

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INFLUENCE OF EXTRACORPOREAL CIRCULATION ON SERUM DIGOXIN LEVELS

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At the Clinic of Cardiovascular Surgery in Sremska Kamenica during the immediate postoperative course the patients were administered high doses of digoxin. In respect to the fact that among the operated persons there was a group of patients in whom cardiotonic therapy was preoperatively used, this paper was aimed at determining serum digoxin levels prior to extracorporeal circulation, immediately after this procedure and afer 7 days. As digoxin has a narrow volume of distribution due to haemodilution and hypothermia during open heart surgery and because of controversial data in literature and scientific papers the aim of the paper was to check-up serum digoxin levels and to establish whether there was a risk of digoxin intoxication in our group of patients. The study comprised 47 patients with normal hepato-renal function who had serum digoxin levels within the terapeutic range. Haemoglobin and total protein values were followed-up at the same time. The mean digoxin value prior to ECC was 1.37 ng/mL, after ECC 1.07 ng/mL (78.1%) and after 7 days 1.58 ng/mL. After a 7 day – period serum digoxin le-

(78,1%) i nakon 7 dana 1,58 ng/mL. Pet pacijenata je nakon 7 dana imalo vrednosti digoksina u krvi preko gornje granice (2 ng/mL), s tim da je najveća vrednost bila 2,61 ng/mL. Sniženje hemoglobina i ukupnih proteina nakon ECC je procentualno bilo značajno veće u odnosu na početne vrednosti. Prosečna vrednost hemoglobina pre ECC iznosila je 137,3 g/L (Sd ± 11,6), nakon ECC 81,6 g/L (Sd ± 13,7 g/L) (ili 59,4% u odnosu na bazalni nivo), i nakon 7 dana 118,6 g/L (Sd ± 12,9 g/L). Prosečna vrednost ukupnih proteina pre ECC je bila 75,8 g/L (Sd ± 8,28 g/L), nakon ECC 48,97 g/L (Sd ± 5,97 g/L) (ili 64,6% u odnosu na bazalni nivo) nakon 7 dana 68,5 g/L (Sd ± 5,47 g/L). Prema nađenom Serumske vrednosti digoksina i nakon ECC ostaju u terapeutskim granicama i ne dolazi do intoksikacije pacijenata, iako su prethodno bili digitalizovani.

vels were over the upper limit (2 ng/mL) in 5 patients, the highest value being 2.61 ng/mL. Percentually, the fall in haemoglobin and total protein levels after ECC was considerably higher when compared with the initial values. Mean haemoglobin value prior to ECC was 137.3 g/L (SD ± 11.6 g/L), after ECC 81.6 g/L (SD ± 13.7 g/L) (or 59.4% in respect to the basal level), and after 7 days it amounted to 118.6 g/L (SD ± 12.9 g/L). Mean total protein value prior to ECC was 75.8 g/L (SD ± 8.28 g/L), after ECC 48.97 g/L (SD ± 5.97 g/L) (or 64.6% in respect to the basal level) and after 7 days 68.5 g/L (SD ± 5.47 g/L). According to the results of the study, serum digoxin levels after ECC remained within the therapeutic limits and were not the result of the patients intoxication, althought they were previously digitalized.