UTICAJ GEOMETRIJE LEVE KOMORE, ISKAZANE DEBLJINOM INTERVENTRIKULARNOG SEPTUMA I ZADNJEG ZIDA KOMORE, NA ISHOD AKUTNOG ISHEMIJSKOG MOŽDANOG UDARA

ORIGINALNI RAD

ORIGINAL ARTICLE

IMPACT OF LEFT VENTRICULAR GEOMETRY, EXPRESSED AS INTERVENTRICULAR SEPTAL AND POSTERIOR WALL THICKNESS, ON THE OUTCOME OF ACUTE ISCHEMIC STROKE

Dejan Munjiza[1], Biljana Georgievski-Brkić[1,2], Filip Vitošević[1], Ljubica Dimitrijević[1], Marjana Vukićević[1,2]

[1] Specijalna bolnica „Sveti Sava", Beograd, Srbija

[2] Univerzitet u Kragujevcu, Fakultet medicinskih nauka, Kragujevac, Srbija

[1] *Special Hospital Sveti Sava, Belgrade, Serbia*

[2] *University of Kragujevac, Faculty of Medical Sciences, Kragujevac, Serbia*

SAŽETAK

Uvod/Cilj: Značajni udeo zdravstvenog opterećenja stanovništva obuhvata akutni moždani udar. Varijable dobijene transtorakalnom ehokardiografijom predstavljaju jasne prediktore ishoda kardioloških oboljenja, ali je i sve više dokaza o njihovom značaju u predviđanju ishoda neuroangioloških oboljenja.

Cilj rada jeste da se dokaže hipoteza da je promena geometrije leve komore iskazana porastom dimenzije zidova leve komore primenljiv marker lošeg ishoda akutnog moždanog udara.

Materijali i metode: Metodologija je bazirana na analizi ultrazvučnih varijabli 167 pacijenata koji su pretrpeli akutni moždani udar ishemijske geneze, uz analizu varijabli modifikovanog Rankin skora definisanog pri otpustu sa lečenja, a kao pokazatelja ishoda bolesti u funkcionalnom smislu.

Rezultati: Rad ukazuje na korelacija između debljine kako interventrikularnog septuma tako i zadnjeg zida leve komore sa jedne i funkcionalnog stanja bolesnika, sa druge strane. Hipoteza se pokazala tačnom, odnosno porastom dijametra interventrikularnog septuma i/ili zadnjeg zida leve komore, raste i mogućnost lošijeg ishoda bolesti.

Zaključak: Oba praćena parametra pokazuju pozitivnu prediktivnu vrednost u odnosu na stepen funkcionalnosti pacijenata pri otpustu.

Ključne reči: moždani udar, promena geometrije leve komore, ehokardiografija

ABSTRACT

Introduction/Objective: Acute stroke represents a significant component of the overall health burden of the population. Parameters obtained by transthoracic echocardiography are well-established predictors of outcomes in cardiovascular diseases, while increasing evidence indicates their importance in predicting outcomes in neurovascular disorders.

This study aims to test the hypothesis that changes in left ventricular geometry, expressed as an increase in left ventricular wall thickness, represent a useful marker of poor outcome in patients with acute ischemic stroke.

Materials and methods: The methodology was based on the analysis of echocardiographic variables in 167 patients with acute ischemic stroke, together with variables of the modified Rankin Scale assessed at hospital discharge, used as an indicator of functional outcome.

Results: The study indicates a correlation between the thickness of both the interventricular septum and the posterior wall of the left ventricle, on the one hand, and the functional status of patients, on the other. The results confirmed the study hypothesis, demonstrating that an increase in interventricular septal thickness and/or posterior left ventricular wall thickness is associated with a higher probability of unfavorable outcome.

Conclusion: Both evaluated echocardiographic parameters showed positive predictive value in relation to functional outcomes.

Keywords: stroke, changes in left ventricular geometry, echocardiography

Autor za korespondenciju:
Dejan Munjiza
Specijalna bolnica „Sveti Sava"
Nemanjina 2, 11000 Beograd, Srbija
Elektronska adresa: munjizad@gmail.com

Corresponding author:
Dejan Munjiza
Special Hospital Sveti Sava
2 Nemanjina Street, 11000 Belgrade, Serbia
E-mail: munjizad@gmail.com

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UVOD

Moždani udar i dalje zauzima drugo mesto na skali uzroka smrtnosti, a na globalnom nivou predstavlja treći po učestalosti zajednički uzrok smrti i invaliditeta [1]. Nadalje, postojeće prognoze upućuju na dalji rast stope incidencije ovog oboljenja u tekućoj deceniji, odnosno do 2030. godine, prvenstveno u zemljama sa niskim dohotkom, i to bez razlike u odnosu na pol ili godine [2]. Broj novoobolelih sa moždanim udarom raste od 1990. godine, uporedo sa povećanjem smrtnosti, a u istom razdoblju su se smanjile stope incidencije standardizovane prema starosti [3]. Pregled meta-analiza pokazuje da je u Evropi incidencija moždanog udara oko 191,9 na 100.000 osoba-godina uz prevalenciju koja je procenjena na oko 9,1% kod muškaraca i oko 9,2% kod žena, uz trend porasta [4]. Ova bolest predstavlja četvrti uzrok smrtnosti u Sjedinjenim Američkim Državama [5].

Klasični faktori rizika ateroskleroze predstavljaju ujedno i faktore rizika ishemijskog moždanog udara, pa ne čudi činjenica da moždani udar u ogromnoj većini slučajeva prati više kardioloških komorbiditeta. Otuda ideja da osnovne varijable geometrije miokarda leve komore dobijene transtorakalnom ehokardiografijom, odnosno debljinu interventrikularnog septuma (IVS) i zadnjeg zida (ZZ) leve komore, procenimo kao potencijalne prediktore ishoda kod akutnog moždanog udara.

Cilja rada je da se proceni povezanost debljine interventrikularnog septuma (IVS) i zadnjeg zida (ZZ) leve komore, kao „sirovih" i svima dostupnih *bed-side* ehokardiografskih parametara, a koji ne zahtevaju sofisticiranije kompjuterske programe, sa ishodom lečenih pacijenata sa moždanim udarom ishemijskog tipa. Ovo je učinjeno testiranjem hipoteze da je povećana debljina interventrikularnog septuma (IVS) i zadnjeg zida (ZZ) leve komore potencijalni pokazatelj ishoda ovog oboljenja.

MATERIJALI I METODE

Svi podaci su prikupljeni retrospektivno, nakon okončanja hospitalizacije, iz bolničke medicinske dokumentacije, za ukupno 167 bolesnika lečenih od akutnog ishemijskog moždanog udara u Jedinici intenzivne nege nivoa III Specijalne bolnice „Sveti Sava", i to u periodu od 1. septembra 2024. godine do 1. septembra 2025. godine. Pored opštih demografskih odrednica uzorka (pol i starost ispitanika), uzeti su i podaci o klasičnim faktorima rizika uz ispitivane parametre transtorakalnih ehokardiografskih studija, odnosno debljine interventrikularnog septuma (IVS) i zadnjeg zida (ZZ) leve komore, merenih na parasternalnom uzdužnom preseku (engl. *parasternal long axis – PLAX*).

Ostvareni rezultati lečenja ispitanika, procenjeni primenom modifikovane Rankin skale pri otpustu

INTRODUCTION

Stroke remains the second leading cause of mortality and, globally, represents the third most common combined cause of death and disability [1]. Furthermore, current projections indicate a continued increase in the incidence of this disease during the present decade, up to 2030, primarily in low-income countries and without significant differences with respect to sex or age [2]. Since 1990, the number of newly diagnosed stroke cases has been increasing in parallel with mortality, although age-standardized incidence rates have decreased over the same period [3]. A review of meta-analyses indicates that, in Europe, the incidence of stroke is approximately 191.9 per 100,000 person-years, with prevalence estimated at about 9.1% in men and 9.2% in women, and with a continuing upward trend [4]. Stroke represents the fourth leading cause of death in the United States [5].

Classical risk factors for atherosclerosis are also major risk factors for ischemic stroke; therefore, it is not surprising that in the vast majority of cases multiple cardiological comorbidities accompany stroke. This fact prompted the idea of evaluating basic parameters of left ventricular myocardial geometry obtained by transthoracic echocardiography – namely, the thickness of the interventricular septum (IVS) and of the left ventricular posterior wall (PW), as potential predictors of outcome in acute stroke.

The present study aims to assess the association between the thickness of the interventricular septum (IVS) and the posterior wall (PW) of the left ventricle, as "raw" and universally available bedside echocardiographic parameters that do not require more sophisticated computer programs, and the outcome of patients treated for ischemic stroke. This was done by testing the hypothesis that increased IVS thickness and left ventricular PW thickness are potential indicators of the outcome of this disease.

MATERIALS AND METHODS

Data were collected retrospectively from hospital medical records, after patient discharge, for a total of 167 patients treated for acute ischemic stroke in the Level III Intensive Care Unit of the Special Hospital *Sveti Sava*, between September 1, 2024 and September 1, 2025. In addition to the general demographic sample characteristics (sex and age of the participants), data were also collected regarding classical risk factors along with the examined parameters of transthoracic echocardiographic studies, namely the interventricular septum (IVS) thickness and the thickness of the left ventricular posterior wall (PW), measured in the parasternal long-axis view (PLAX).

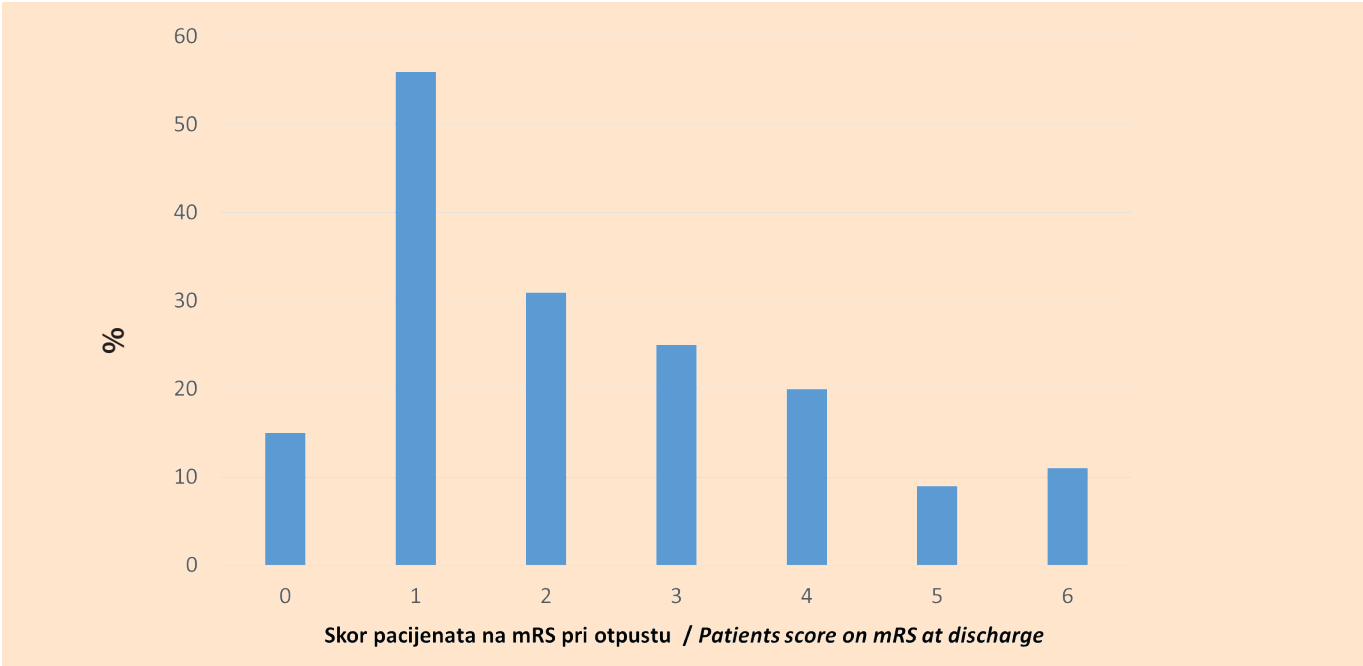
Tabela 1. Raspodela odgovora na modifikovanoj Rankin skali (mRS)

Table 1. Distribution of responses on the Modified Rankin scale (mRS)

mRS	Opis / *Description - Levels*	*n (%)*
0	Potpuni oporavak / *No symptoms at all*	15 (9.0%)
1	Bez značajne onesposobljenosti – pacijent sposoban za obavljanje svih aktivnosti / *No significant disability: despite symptoms, able to carry out all usual duties and activities*	56 (33.4%)
2	Laka onesposobljenost – pacijent sposoban za samozbrinjavanje ali ne i za sve premorbidne aktivnosti / *Slight disability: unable to perform all previous activities but able to look after own affairs without assistance*	31 (18.6%)
3	Umerena onesposobljenost – pacijentu je neophodna pomoć ali je sposoban za samostalni hod / *Moderate disability: requiring some help but able to walk without assistance*	25 (15.0%)
4	Umereno teška onesposobljenost – pacijent nije sposoban za samostalni hod / *Moderately severe disability: unable to walk without assistance and unable to attend to own bodily needs without assistance*	20 (12.0%)
5	Teška onesposobljenost – pacijent je nepokretan i kompletno zavisan od tuđe nege i pomoći / *Severe disability: bedridden, incontinent and requiring constant nursing care and attention*	9 (5.4%)
6	Smrtni ishod – pacijent je preminuo / *Death*	11 (6.6%)
UKUPNO / TOTAL		167 (100%)

iz bolnice, predstavljali su obeležje ishoda oboljenja, s obzirom da je navedena skala najučestaliji klinički alat za procenu stepena invaliditeta nakon moždanog udara. Sve ultrazvučne preglede obavio je iskusni kardiolog – ehokardiografista u prvih 72 sata od prijema na Odeljenje intenzivne nege, aparatom *GE LOGIQ S8*. Tabela 1 razvrstava ispitanike prema njihovom skoru na modifikovanoj Rankin skali (mRS), dok Grafikon 1 predstavlja grafički prikaz distribucije bolesnika prema ovoj karakteristici.

The achieved patient treatment outcomes were assessed using the modified Rankin Scale at hospital discharge and were taken to represent the indicator of disease outcome, as this scale is the most commonly used clinical tool for assessing the degree of disability after stroke. All ultrasound examinations were performed by an experienced cardiologist–echocardiographer within the first 72 hours after admission to the Intensive Care Unit, using a GE LOGIQ S8 device. Table 1 classifies the participants according to their score on the modified Rankin



Grafikon 1. Prikaz raspodele subjekata (relativna učestalost) po grupama modifikovane Rankin skale

Figure 1. Relative frequency distribution of modified Rankin Scale categories

Opis podataka je predstavljen u formi apsolutne i relativne učestalosti (n,%) uz primenu aritmetičke sredine sa standardnom devijacijom (as ± sd) ili medijane (opseg, min – max), što su diktirali statistički oblik i raspodela promenljivih. Povezanost stepena ishoda oboljenja sa ispitivanim ehokardiografskim statističkim karakteristikama je ocenjena upotrebom Spirmanovog koeficijenta korelacije. Za proveru statističke značajnosti radnih hipoteza uzet je alfa nivo od 0,05. Za statističku analizu podataka korišćen je programski alat *IBM SPSS Statistics 24* (*SPSS Inc, Chicago, IL, USA*).

REZULTATI

Analizom je obuhvaćeno ukupno 167 pacijenata lečenih od akutnog ishemijskog moždanog udara. Prosek starosti uzorka je bio oko 67 godina (67,1 godina sa standardnom devijacijom 12,2 godina), od čega je 108 ispitanika bilo muškog a 59 ženskog pola. Najstariji bolesnik je imao 91 godinu, a najmlađi 35 godina. Demografski opis uzorka i raspodela faktora rizika predstavljeni su u Tabeli 2. Svi analizirani subjekti su imali urađenu transtorakalnu ehokardiografsku studiju kojom je meren dijametar interventrikularnog septuma (IVS) i zadnjeg zida (ZZ) leve komore po standardima Američkog društva ehokardiografista (engl. *American Society of Echocardiography – ASE*) i Evropskog udruženja za kardiovaskularni imidžing (engl. *European Association of Cardiovascular Imaging – EACVI*). Prosečne vrednosti za obe varijable sa standardnim devijacijama su prikazane u Tabeli 3.

Dijametar IVS, definisan prema *ASE/EACVI* preporukama kao univerzalni i široko rasprostranjeni marker geometrije leve komore, korišćen je kao determinanta ishoda oboljenja posmatranog uzorka. Testiranje rezultata lečenja prema dijametru IVS/ZZ je sprovedeScale (mRS), while Figure 1 is a graphical representation of the distribution of patients according to this characteristic.

The description of the data is presented in the form of absolute and relative frequencies (n, %) with the use of the arithmetic mean with standard deviation (mean ± SD) or the median (range, min-max), as dictated by the statistical form and distribution of the variables. The association between the degree of disease outcome and the examined echocardiographic statistical characteristics was evaluated using Spearman's correlation coefficient. For testing the statistical significance of the working hypotheses, an alpha level of 0.05 was used. The IBM SPSS Statistics 24 (SPSS Inc., Chicago, IL, USA) software was used for statistical data analysis.

RESULTS

The analysis included a total of 167 patients treated for acute ischemic stroke. The average age of the sample was approximately 67 years (67.1 years with a standard deviation of 12.2 years), of whom 108 were male, and 59 were female. The oldest patient was 91 years old, while the youngest was 35 years old. The demographic characteristics of the sample and the distribution of risk factors are presented in Table 2. All analyzed subjects underwent a transthoracic echocardiographic study wherein the diameter of the interventricular septum (IVS) and of the left ventricular posterior wall (PW) were measured according to the standards of the American Society of Echocardiography (ASE) and the European Association of Cardiovascular Imaging (EACVI). The mean values for both variables with standard deviations are presented in Table 3.

The IVS diameter, defined in keeping with ASE/EACVI recommendations as a universal and widely used marker of left ventricular geometry, was used as a

Tabela 2. Demografske varijable, faktori rizika i medijana ishoda bolesti

Table 2. Demographic variables, risk factors and median score of disease outcome

Varijable / *Variables*	
Pol, n (%) / *Sex, n (%)*	
muški / *male*	108 (64.7%)
ženski / *male*	59 (35.3%)
Starost, as ± sd / *Age, mean ± sd*	67.1 ± 12.2
Hipertenzija, n (%) / *Hypertension, n (%)*	152 (91%)
Atrijalna fibrilacija, n (%) / *Atrial fibrillation, n (%)*	60 (35.9%)
Diabetes mellitus, n (%) / *Diabetes mellitus, n (%)*	45 (26.9%)
Hiperlipidemija, n (%) / *Hyperlipidemia, n (%)*	43 (25.7%)
Pušenje, n (%) / *Smoking, n (%)*	57 (34.1%)
Zloupotreba alkohola, n (%) / *Alcohol abuse, n (%)*	*9 (5.4%)*
Gojaznost, n (%) / *Obesity, n (%)*	16 (9.6%)
Skor na Rankin skali, medijana (opseg) / *Score on the Rankin scale, median (range)*	2 (0–6)

Tabela 3. Ehokardiografski parametri

Table 3. Echocardiographic parameters

Varijable / *Variables*	as ± sd / *Mean ± sd*	Minimum	Maximum
IVS, as ± sd / *IVS, mean ± sd*	10.18 ± 2.57	7	17
ZZLK, as ± sd / *LVPW, mean ± sd*	9.85 ± 2.77	7	19

IVS – interventrikularni septum; ZZLK – zadnji zid leve komore

IVS – interventricular septum; LVPW – left ventricular posterior wall

Tabela 4. Spirmanov koeficijent i verovatnoća

Table 4. Spearman's correlation coefficients and p-values

Varijable / *Variables*	Povezanost / *Mean ± sd*	Skor na modifikovanoj Rankin skali / *Modified Rankin scale score*
IVS / *IVS*	r_s	0,91
	p	0,01
ZZLK / *LVPW*	r_s	0,88
	p	0,01

IVS – interventrikularni septum; ZZLK – zadnji zid leve komore

IVS – interventricular septum; LVPW – left ventricular posterior wall

no upotrebom neparametarske korelacije navedenih varijabli i krajnjeg dobijenog skora na modifikovanoj Rankin skali.

Analizom, putem Spirmanove korelacije, pokazan je značajan stepen korelacije između ishoda bolesti i dijametra IVS sa pozitivnim predznakom (r_s = 0,91; p = 0,01; Tabela 4), odnosno, da lošija geometrija leve komore, izražena porastom dijametra IVS, povećava stepen funkcionalne onesposobljenosti bolesnika nakon akutnog ishemijskog moždanog udara.

Dijametar posteriornog zida leve komore, definisan po istim preporukama, takođe je testiran kao potencijalna varijabla prognoze kliničkog ishoda. I ovde, veća vrednost varijable značajno korelira sa višim stepenom Rankin skora (r_s = 0,88; p = 0,01; Tabela 4), odnosno veći dijametar zadnjeg zida leve komore sugeriše nepovoljniji klinički tok kod pacijenata sa akutnim ishemijskim moždanim udarom.

DISKUSIJA

Ispitivanje je obuhvatilo 167 bolesnika oba pola, sa akutnim ishemijskim moždanim udarom, uz dominaciju muškaraca (64,7%). Ukupna prosečna starost pacijenata je bila oko 67 godina.

Među prikupljenim, poređenim i analiziranim ultrazvučnim obeležjima ovog uzorka, kao pokazatelji lošeg kliničkog ishoda sa statistički relevantnim stepenom pozitivne povezanosti su se pokazali i dijametar interventrikularnog septuma kao i dijametar zadnjeg zida leve komore, definisani standardima Američkog društva ehokardiografista (*ASE*) i Evropskog udruženja za kardiovaskularni imidžing (*EACVI*) [6,7]. Dakle, po-

determinant of disease outcome in the observed sample. Testing of treatment outcomes in relation to the IVS/PW diameter was carried out using non-parametric correlation between these variables and the final obtained score on the modified Rankin Scale.

Spearman's correlation analysis showed a significant degree of correlation between disease outcome and the IVS diameter, with a positive correlation coefficient (r_s = 0.91; p = 0.01; Table 4), indicating that poorer left ventricular geometry, expressed by an increase in IVS diameter, increases the degree of functional disability of patients after acute ischemic stroke.

The diameter of the posterior left ventricular wall, defined in keeping with the same recommendations, was also tested as a potential variable for the prognosis of clinical outcome. Here also, a higher value of the variable significantly correlated with a higher score on the modified Rankin Scale (r_s = 0.88; p = 0.01; Table 4), i.e., a larger diameter of the left ventricular posterior wall suggested a less favorable clinical course in patients with acute ischemic stroke.

DISCUSSION

The study included 167 patients of both sexes with acute ischemic stroke, with a predominance of men (64.7%). The overall mean age of the patients was approximately 67 years.

Among the collected, compared, and analyzed ultrasound characteristics of this sample, the diameter of the interventricular septum as well as the diameter of the posterior wall of the left ventricle, defined by the standards of the American Society of Echocardiography

rast debljine kako interventrikularnog septuma tako i zadnjeg zida leve komore povećava stepen funkcionalne onesposobljenosti bolesnika nakon akutnog ishemijskog moždanog udara.

U savremenim uslovima, u većini radova se kao osnovni markeri geometrije leve komore koriste jasno definisani parametri kao što su masa leve komore ili relativna debljina zida leve komore (engl. *left ventricular relative wall thickness - LV RWT*), što je svakako ispravnije jer bolje prognostički korelira sa ishodima kardiovaskularnih bolesti [8–12], ali zahteva sofisticiranije ehokardiografske softvere i nije primenjivo za *bed-side* preglede kakvi su kod akutnog moždanog udara najizvodljiviji zbog stanja bolesnika. Drugi motiv za rad sa bazičnim podacima je činjenica da su upravo sirovi podaci o debljini IVS analizirani i od strane drugih autora kod bolesnika sa hipertenzijom [13], koja se tradicionalno smatra najdefinisanijim faktorom rizika od moždanog udara. Pokazano je da povećana debljina interventrikularnog septuma predstavlja nezavisan i značajan prediktor budućeg razvoja koronarne bolesti i infarkta miokarda. Takođe, u populaciji pacijenata sa atrijalnom fibrilacijom uključenih u *Atrial Fibrillation Follow-up Investigation of Rhythm Management* (*AFFIRM*) studiju, hipertrofija leve komore (engl. *left ventricular hypertrophy – LVH*) definisana kao umereno ili znatno uvećana debljina interventrikularnog septuma pokazala se kao prediktor ukupnog mortaliteta i moždanog udara, nezavisno od klasičnih kliničkih faktora rizika, dok je definicija hipertrofije leve komore bazirana na debljini IVS imala jaču i konzistentniju prognostičku vrednost u poređenju sa samom masom leve komore [14].

U opštoj populaciji, povećana masa leve komore procenjena ehokardiografski, predstavlja nezavisan i snažan prediktor nepovoljnih kardiovaskularnih ishoda, uključujući incidentne kardiovaskularne događaje i ukupni mortalitet, čak i nakon korekcije za tradicionalne faktore rizika [15].

Manji je broj studija koje se bave direktnim uticajem debljine interventrikularnog septuma i/ili zadnjeg zida leve komore na ishod pacijenata obolelih od akutnog ishemijskog moždanog udara, ali one postoje i uglavnom se baziraju na naprednijim podacima geometrije ili na ocenu globalne sistolne funkcije leve komore. Studija koju su sproveli Adeoje i saradnici pokazuje da se debljina interventrikularnog septuma razlikovala kod pacijenata sa ishemijskim moždanim udarom, ali nije identifikovana kao nezavisni prediktor ishoda nakon akutnog moždanog udara [16]. Napominjemo da je u ovoj studiji, analiziran ishod u kraćem, jednomesečnom periodu nakon ishemijskog moždanog udara kod populacije koja je mlađa od populacije naše studije, te da je istraživanje sprovedeno u

(ASE) and the European Association of Cardiovascular Imaging (EACVI) [6,7], proved to be indicators of poor clinical outcome with a statistically relevant degree of positive association. Thus, an increase in the thickness of both the interventricular septum and the left ventricular posterior wall increases the degree of functional disability of patients after acute ischemic stroke.

In most modern studies, clearly defined parameters such as left ventricular mass or left ventricular relative wall thickness (LV RWT) are used as the basic markers of left ventricular geometry, which is certainly more appropriate because it better correlates prognostically with the outcomes of cardiovascular diseases [8–12]. However, such diagnostics requires more sophisticated echocardiographic software and is not applicable for bedside examinations such as those that are most feasible in acute stroke due to the condition of the patient. Another motive for working with basic data is the fact that raw data on IVS thickness have also been analyzed by other authors in patients with hypertension [13], which is traditionally considered the most clearly defined risk factor for stroke. It has been shown that increased interventricular septum thickness represents an independent and significant predictor of the future development of coronary disease and myocardial infarction. Furthermore, in the population of patients with atrial fibrillation included in the Atrial Fibrillation Follow-up Investigation of Rhythm Management (AFFIRM) study, left ventricular hypertrophy (LVH), defined as moderately or markedly increased interventricular septum thickness, proved to be a predictor of overall mortality and stroke, independent of classical clinical risk factors, while the definition of left ventricular hypertrophy based on IVS thickness had stronger and more consistent prognostic value compared with left ventricular mass alone [14].

In the general population, increased left ventricular mass assessed echocardiographically represents an independent and powerful predictor of adverse cardiovascular outcomes, including incident cardiovascular events and overall mortality, even after adjustment for traditional risk factors [15].

There are fewer studies dealing with the direct impact of interventricular septum thickness and/or left ventricular posterior wall thickness on the outcome of patients with acute ischemic stroke, but they do exist and are generally based on more advanced geometric data or on the assessment of left ventricular global systolic function. A study conducted by Adeoye et al. showed that interventricular septum thickness differed in patients with ischemic stroke, but it was not identified as an independent predictor of outcome after acute stroke [16]. We note that in this study the outcome was

Africi. Drugi autori, dolaze do podataka koji su u skladu sa našim istraživanjem, odnosno da je povećana relativna debljina zida leve komore (*LV RWT*) bila povezana sa višom smrtnošću nakon ishemijskog moždanog udara, što sugeriše da promene u strukturi leve komore, uključujući zadebljanje zidova, imaju prognostičku važnost [17]. Povezanost sa našim rezultatima se ogleda u činjenici da se *LV RWT*, između ostalog, računa u dimenziji zadnjeg zida leve komore.

Slična istraživanja su rađena i kod bolesnika sa hemoragijskim moždanim udarom, koji nisu bili uključeni u naše istraživanje, ali ih navodimo s obzirom da u ovoj varijanti moždanog udara, po dostupnoj literaturi, debljina interventrikularnog septuma i debljina zadnjeg zida leve komore nisu pokazale značajnu povezanost sa ishodom bolesti [18].

ZAKLJUČAK

Oba ciljana ultrazvučna parametara pokazuju značajnu pozitivnu prediktivnu vrednost za ishod bolesti. Naime, među analiziranim kategorijama bolesnika, postoji statistički značajna povezanost između dijametara, kako interventrikularnog septuma tako i posteriornog zida leve komore, sa postignutim ishodom lečenja akutnog ishemijskog moždanog udara, ocenjenog putem modifikovan Rankin skale, i to tako što porast debljine zidova leve komore favorizuje lošiji funkcionalni ishod moždanog udara.

Moždani udar, kao deo spektra kardiovaskularnih bolesti, retko se javlja izolovano od kardioloških komorbiditeta, koji sami po sebi utiču na način lečenja osnovne bolesti. Danas je terapija vođena savremenim algoritmima ali je i dalje akcenat na individualizaciji, koju diktiraju patofiziologija svih paralelnih komorbiditeta i druge specifičnosti svakog bolesnika. Moždani udar je, dakle, uobičajeno multimorbidno stanje gde postoji međusobna interakcija patoloških stanja, usled čega postoji potreba za multidisciplinarnim pristupom dijagnostici, lečenju i proceni prognoze bolesnika.

SPISAK SKRAĆENICA

IVS – interventrikularni septum
ZZ – zadnji zid (leve komore)
PLAX – parasternalni uzdužni presek (engl. *parasternal long axis*)
ASE – Američko društvo ehokardiografista (engl. *American Society of Echocardiography*)
EACVI – Evropsko udruženje za kardiovaskularni imidžing (engl. *European Association of Cardiovascular Imaging*)
LV RWT – relativna debljina zida leve komore (engl. *left ventricular relative wall thickness*)

Sukob interesa: Nije prijavljen.

analyzed in a shorter, one-month period after ischemic stroke in a population that was younger than the population of our study, and that the research was conducted in Africa. Other authors have obtained data consistent with our research, namely that increased left ventricular relative wall thickness (LV RWT) was associated with higher mortality after ischemic stroke, suggesting that changes in the structure of the left ventricle, including wall thickening, have prognostic significance [17]. The association with our results is reflected in the fact that LV RWT, among other things, is calculated using the dimension of the posterior wall of the left ventricle.

Similar studies have also been conducted in patients with hemorrhagic stroke, who were not included in our research, but we mention them given that in this variant of stroke, according to the available literature, the thickness of the interventricular septum and the thickness of the left ventricular posterior wall did not show a significant association with disease outcome [18].

CONCLUSION

Both targeted ultrasound parameters show significant positive predictive value for the disease outcome. Namely, among the analyzed categories of patients, there is a statistically significant association between the diameters of both the interventricular septum and the left ventricular posterior wall and the achieved outcome of treatment of acute ischemic stroke, as assessed using the modified Rankin scale. The association is such that an increase in the thickness of the walls of the left ventricle favors a poorer functional outcome of stroke.

Stroke, as part of the spectrum of cardiovascular diseases, rarely occurs isolated from cardiological comorbidities, which themselves influence the manner of treatment of the underlying disease. Today, therapy is guided by modern algorithms, but the emphasis is still on individualization, which is dictated by the pathophysiology of all parallel comorbidities and other specific characteristics of each patient. Stroke is therefore commonly a multimorbid condition wherein there is interaction between pathological states, which creates the need for a multidisciplinary approach to the diagnosis, treatment, and assessment of patient prognosis.

LIST OF ABBREVIATIONS/ACRONYMS

IVS – interventricular septum
PW – posterior wall (of the left ventricle)
PLAX – parasternal long axis
ASE – American Society of Echocardiography
EACVI – European Association of Cardiovascular Imaging
LV RWT – left ventricular relative wall thickness

Conflict of interest: None declared

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