UTICAJ POVEĆANE TELESNE TEŽINE NA VELIČINU LEVE PRETKOMORE KOD BOLESNIKA SA ARTERIJSKOM HIPERTENZIJOM

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Arterijska hipertenzija predstavlja jedan od uzroka povećanja leve pretkomore. Ovo ispitivanje je imalo za cilj da se odredi uticaj povećanja telesne težine na veličinu leve pretkomore kod pacijenata sa dokazanom arterijskom hipertenzijom.

Konvencionalnim ehokardiografskim metodama određivana je veličina leve pretkomore kod 114 pacijenata sa arterijskom hipertenzijom drugog stepena (srednja vrednost sistolnog arterijskog pritiska je iznosila 168±9mmHg a dijastolnog 101±7mmHg). Pacijenti su na osnovu vrednosti indeksa telesne mase (BMI) podeljeni u grupu normalno uhranjenih (BMI 20±3,3kg/m^2), umereno gojaznih (BMI 27±2,1kg/m^2) i gojaznih (BMI 32±4,2 kg/m^2). Na ovako podeljenom uzorku bolesnika ispitivan je uticaj telesne težine na veličinu leve pretkomore.

Leva pretkomora je bila značajno uvećana kod gojaznih osoba (4,5±0,6cm) u odnosu na umereno gojazne (4,2±0,4cm) ili normalno uhranjene (3,7±0,4cm) osobe ($p<0,05$). Povećanje leve pretkomore (>4,0cm) je nađeno kod 65% gojaznih, 40% umereno gojaznih i 19% normalno uhranjenih pacijenata. Nađena korelacija između dijametara leve pretkomore i vrednosti srednjeg arterijskog krvnog pritiska ($r=0,23$; $p<0,05$) je imala manju statističku značajnost.

Gojaznost je značajan preduslov povećanja dimenzije leve pretkomore kod obolelih od arterijske hipertenzije.

Arterijska hipertenzija uzrokuje promene na srcu. U njih se, između ostalih, ubrajaju povećanje mase leve komore i dilatacija leve pretkomore. Poznato je da je hipertrofija miokarda leve komore prediktor kardiovaskularnih događaja. Povećanje dijametra leve pretkomore udruženo sa porastom učestalosti atrijalne fibrilacije predstavlja preduslov moždanih udara / 1,2/.

Korišćenjem ehokardiografije dokazano je da starost, pol, gojaznost i rasa predstavljaju bitne kofakore u pojavi dilatacije leve pretkomore /3/.

Cilj ovog ispitivanja je da se odredi uticaj povećanja telesne težine na veličinu leve pretkomore, kod pacijenata sa dokazanom arterijskom hipertenzijom.

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Pacijenti i metodologija

U ispitivanje je uključeno 114 bolesnika (63 muškarca i 51 žena) sa arterijskom hipertenzijom drugog stepena. Iz ispitivanja su isključeni bolesnici sa anamezom i kliničkim manifestacijama koronarne bolesti, srčane insuficijencije, valvularnim manama, atrijalnom fibrilacijom.

U podeli bolesnika prema stepenu gojaznosti korišćen je indeks telesne mase (BMI) koji se izražava kao količnik telesne težine i kvadrata telesne visine (kg/m^2). Grupu normalno uhranjenih činili su pacijenti čiji je BMI bio< 24,9 kg/m^2 (29 pacijenata). Grupu pacjenata sa prekomernom težinom odnosno tzv. umereno gojaznih činili su oni sa BMI od 25 do 29,9 kg/m^2 (40 pacijenata). Za grupu gojaznih bio je karakterističan BMI> 30 kg/m^2 (45 bolesnika).

Vrednost arterijskog krvnog pritiska su određivane konvencionalnim merenjem, sfingomanometrom, na levoj ruci, u sedećem položaju. Vrednosti sistolnog i dijastolnog arterijskog krvnog pritiska su određivane na osnovu prve i pete Korotkoff-ove faze.

Kod svih ispitanika učinjeno je konvencionalno ehokardiografsko ispitivanje (M-mod tehnikom pod kontrolom dvodimenzijskog ehokardiograma). Veličina leve pretkomore određivana je u saglasnosti sa preporukama Američkog udruženja za ehokardiografiju prema kome se meri maksimalni dijametar između posteriornog zida aortnog korena i zadnjeg zida leve pretkomore u endsistoli. Dijametar leve pretkomore veći od 4,0 cm uziman je za kriterijum povećanja leve pretkomore. U izračunavanju mase leve komore korišćena je modifikovana cube formula po Penn konvenciji : masa leve komore (g)=1.04[(unutrašnji dijametar leve komore u enddijasoli + debljina interventrikularnog septuma + debljina zadnjeg zida)^3 - (unutrašnji dijametar leve komore u dijastoli)^3]-13.6.

Rezultati

Prosečna starost pacijenata uključenih u ispitivanje je iznosila 54±7,2 godine. U ispitivanih pacijenata srednje vrednosti sistolnog pritiska su iznosile 168±9mmHg a dijastolnog 101±7mmHg. Hipertrofija miokarda leve komore nađena je kod 24% pacijenata a srednja vrednost mase leve komore je iznosila 217±23g. Vrednosti visine, težine, ehokardiografskih parametara prikazane su na Tabeli 1.

Tabela 1. Srednje vrednosti visine, težine, i ehokardiografskih parametara

Visina (cm) 169±14
Težina (kg) 75±12
Indeks telesne mase (kg/m2) 29.0± 4.6
Enddijastolni dijametar leve komore (cm) 5,1.±0,4
Debljina interventrikularnog septuma (cm) 1.09±0,7
Debljina zadnjeg zida (cm) 1,04±0,83
Masa leve komore (g) 217 ± 23

U ispitivanoj grupi bolesnika, srednja vrednost dimenzije leve pretkomore je iznosila 4,2±0,53cm (od 2,5 do 5,4cm). Povećanje leve pretkomore je nađeno kod 50 pacijenata (57%), i to kod 43 pacijenta (87%) postojalo je blago do umereno (srednja vrednost dijametra je iznosila 4,39±1,9cm od 4,2 do 4,6cm) a 7 (13%) pacijenata imalo je značajno povećanje leve pretkomore (srednja vrednost 5,0±0,3cm, od 4,7 do 5,2cm).

Veličina leve pretkomore značajno se razlikovala među grupama pacijenata različitog stepena gojaznosti. Veličina leve pretkomore je bila značajno veća kod gojaznih osoba (4,5±0,6cm) u odnosu na umereno gojazne (4,2±0,4cm) ili normalno uhranjene (3,7±0,4cm) osobe ($p<0,05$). Povećanje leve pretkomore (>4,0cm) je nađeno kod 65% gojaznih, 40% pregojaznih i 19% normalno uhranjenih pacijenata.

Nađena je statistički značajna korelcija (navedena od viših ka nižim vrednostima) između dijamtera leve pretkomore i telesne težine ($r=0,44$; $p<0,05$), povećanja dimenzije leve pretkomore i indeksa telesne mase ($r=0,41$; $p<0,05$) i veličine leve pretkomore i mase leve komore ($r=0,35$;). Nađena povezanost povećanja dijametra leve pretkomore i visine srednjeg arterijskog pritiska je imala manju statističku značajnost ($r=0,23$;).

Diskusija

Hipertrofija miokarda leve komore i dilatacija leve pretkomore su manifestacije ciljanog oštećenja srca arterijskom hipertenzijom.

Pre više od 25 godina, Dunn i saradnici su našli da kod hipertenzivnih bolesnika sa elektrokardiogarfskim znacima abnormalnosti leve pretkomore i hipertrofije miokarda leve komore postoje rendgenografski znaci povećanja indeksa leve pretkomore (veličina leve pretkomore/površina tela). Prvom ehokardiografskom studijom o uticaju arterijske hipertenzije na promenu dijametra leve pretkomore, Savage i sardnici su našli da je leva pretkomora bila povećana kod svega 5% pacijenata sa blagom i umerenom arterijskom hipertenzijom. Miller i saradnici su ispitivanjem 14 pacijenata sa hipertenzijom i 10 normotenzivnih osoba, sa normalnim koronarografskim nalazima, našli značajno povećanje dijametra leve pretkomore i indeksa leve pretkomore u grupi obolelih od arterijske hipertenzije /6/. U studiju Pearsona i sar. uključeno je 144 ispitanika SHEP programa i 55 normotenzivnih osoba iste životne dobi i nađeno je značajno povećanje indeksa leve pretkomore u grupi obolelih od hipertenzije u odnosu na grupu normotenzivnih ispitanika /7/.

Koji je mehanizam udruženosti arterijske hipertenzije i povećanja leve pretkomore?

Povišeni sistolni ili pulsni pritisak mogu direktno uticati na dilataciju leve pretkomore. Više studija je ukazalo da na povećanje leve pretkomore utiču trajanje povećanja arterijskog pritiska i vrednost sistolnog pritiska /8-10/. Povećanje leve pretkomore kod obolelih od arterijske hipertezije može biti sekundarno zbog promena u dijastolnoj i sistolnoj funkciji leve komore. Kao rani znak dijastolnog oštećenja leve komore javlja se povećanje leve pretkomore. Dokazano je da je povezanost visine arterijskog pritiska

i povećanja leve pretkomore zasnovano na jasno definisanoj zavisnosti arterijske hipertenzije i hipertrofije miokarda leve komore /11,12/.

U prikazano ispitivanje uključeni su pacijenti sa arterijskom hipertenzijom drugog stepena. Upravo visinom arterijskog krvnog pritska pacijenata uključenih u ispitivanje može se objasniti to što je nađena manje značajna povezanost arterijske hipertenzije i povećanja leve pretkomore.

Visari i saradnici su u delu Framinghamske studije, na velikom uzorku, dokazali da visina arterijskog pritiska i masa leve komore koreliraju sa povećanjem leve pretkomore a statističkom analizom su utvrdili da se promene dijametra leve pretkomore mogu najvećim delom objasniti povećanjem mase leve komore i gojaznošću /8/.

Slično arterijskoj hipertenziji izolovana gojaznost (bez arterijske hipertenzije) je udružena sa promenama na srcu. Gerdts i sar. su našli nezavisnu povezanost gojaznosti sa hipertrofijom leve komore i povećanjem leve pretkomore /9/. Ove alteracije su prepoznate početkom prošlog veka, i karakteriše ih hronično opterćenje pritiskom i volumenom što dovodi do redukcije kontraktilne rezerve leve komore kod gojaznih osoba /13/.

Morricone i saradnici su našli da kod normotenzivnih gojaznih osoba postoji značajno veći enddijastolni dijametar leve komore, zadebljanje interventrikularnog septuma i zadnjeg zida u enddijastoli, povećanje indeksa mase leve komore, veća brzina atrijalnog dijastolnog punjenja, smanjenje odnosa brzina ranog atrijalnog dijastolnog punjenja i produženo vreme izovolumetrijske relaksacije. Kod osoba sa visceralnim tipom gojaznosti nađeno je značajnije zadebljanje interventrikularnog septuma i slobodnog zida kao i povećanje mase leve komore. Zaključili su da morfološke i funkcionalne ehokardiografske alteracije koreliraju sa količinom intraabdominalnih masnih depozita /14/. Ovo ispitivanje je ukazalo da je gojaznost značajan preduslov povećanja dimenzije leve pretkomore.

Gojaznost je nezavisni direktni faktor rizika za kardiovaskularne bolesti i indirektni faktor zbog uloge u nastanku hipertenzije, dijabetes melitusa i hiperlipidemije /15/.

Kombinacija prekomerne aktivnosti simpatičkog nervnog sistema, insulinske rezistencije, abnormalnosti u vaskularnoj strukturi i funkciji odgovorni su za gojaznošću uzrokovanu hipertenziju /16/. Udružene arterijska hipertenzija i gojaznost predstavljaju značajan preduslov promena u građi kardiovaskularnog sistema.

Povećanje leve pretkomore je udruženo sa rizikom od moždanog udara /17/. Mehanizmi porasta rizika od moždanog udara i smrti kod osoba sa povećanjem leve pretkomore nisu kompletno ispitani. Dilatacija leve pretkomore predstavlja preduslov staze krvi koja može biti odgovorna za formiranje tromba i potencijalnu embolizaciju. Trombogenost dilatacije leve pretkomore je potvrđena transezofagusnim studijama u kojima je nađeno da je povećanje leve pretkomore udruženo sa pojavom spontanog ehokardiografskog kontrasta, tromba i embolijskih događaja /18/. Novi izazov predstavlja pokušaj da se utvrdi da li je redukcija veličine leve pretkomore udružena sa smanjenjem učestalosti moždanih udara.

Influence of arterial hypertension and obesity on left atrial size
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It is known that left atrial size can increase in patients with arterial hypertension. The aim of of the presented study was to determine the relative contribution of body weight to left atrial size in patients with established atrial hypertension.

Left atrial size was measured in 114patients with moderate hypertension (mean blood pressure168±9mmHg and 101±7mmHg). The patients was clasificated in three groups: normal weight patients (BMI 20±3,3kg/m^2) preobese patients (BMI 27±2,1 kg/m^2) and obese patients (32±4,2 kg/m^2). On basis of this classification the effects of body weight on left atrial size were examined. Left atrial size was significantly greater in obese (4,5±0,6cm) then in preobese patients (4,2±0,4cm) or normal weight (3,7±0,4cm) patients ($p<0,05$). Left atrial enlargement (>4cm) was presented in 65% obese patients compared witg 49% of preobese and 19% normal weight patients. Left atrial dimension had weakly correlated (r=0,23) with mean blood pressure.

Obesity is the strongest predictor of left atrial size in patients with hypertension

The cardiac effects of hypertension include increases of left ventricular mass and left atrial size. Whereas increases in left ventricular mass has been shown to be a predictor of cardiovascular events, left atrial size is associated with likelihood of developing atrial fibrilation and in addition, it is a predictor of stroke, once atrial fibrillation is manifest /1,2/.

Using by echocardiographic have suggested that age, sex, obesity, and race are other important cofactors in left atrial dilatatin /3/.

The aim of of the presented study was to determine the relative contribution of body weight to left atrial size in patients with established atrial hypertension.

Patients and method

The study included 114 consecutive hypertensive individuals (63 males and 51 females). We excluded subjects for any of the following conditions: history of clinically apparent coronary heart disease, congestive heart failure, valvular heart disease, or atrial fibrillation.

Body mass index (BMI) was selected as a measure of adiposity determined as weight (kg) divided by height squared (m2). “Normal” weight was defined by body mass index <24,9 kg/m^2 (29 patients); “overweight” or “preobese” as 25 to 29,9 kg/m^2 (40 patients); and “obesity” (45 patients) as BMI>30 kg/m2.

At each examination, systolic and diastolic pressure were measured in the left arm with a mercury sphygmomanometer while the subject was seated. Systolic and diastolic pressures were determined by the first and fifth Korotkoff phases, respectively.

Subjects were studied with standard M-mode and twodimensional echocardiography. Left atrial size was determined in accordance with American Soci-

ety of Echocardiography guidelines with the use of a leading edge–to–leading edge measurement of the maximal distance between the posterior aortic root wall and the posterior left atrial wall at end systole. Left atrial enlargement was defined as left atrial dimension greater than or equal to 4,0 cm. The modified cubed formula (with end-diastolic left ventricular [LV] measurements obtained in accordance with the Penn convention) was used to calculate LV mass : LV Mass (g)=1.04[(LV Internal Diameter+LV Septal Thickness+Posterior Wall Thickness)^3- (LV Internal Diameter)^3]-13.6.

Results

Mean age of the patients was 54±7,2 years; the average blood pressure was 168±9/101±7mmHg. The average left ventricular mass was 217±23g. The prevalence of left ventricular hypertrophy was 24%. Baseline height, weight and echocardiographic characteristics shown in Table 1.

Height 169±14(cm)
Weight 75±12 (kg)
Body mass index (kg/m2) 29.0± 4.6
LV diastolic dimension (cm) 5,1.±0,4
Septal thickness (cm) 1.09±0,7
Posterior wall thickness (mm) 1,04±0,83
LV mass (g) 217 ± 23

Table 1. Value of height, weight, echocardiographic parameters

For all patients the average left atrial dimension was 4,2±0,53 cm (range 2.5 to 5,4 cm). Left atrial enlargement was noted in 50 patients (57%). Of these, 43 patients (87%) had mild to moderate enlargement (average 4,39± 1,9, range 4,2 to 4,6 cm) and 7 (13%) had severe enlargement (average 5,0±0,3 cm, range 4,7 to 5,2cm)

Left atrial size differed significantly ($p < 0.05$) across obesity categories. Obese patients had a greater left atrial size (45±0,6 cm) than overweight (4,2±0,4 cm) or normal weight patients (3,7 ±0,4cm). Left atrial enlargement was present in 65% of obese 40% of overweight patients and 18% of normal weight patients ($p < 0.05$)

The strongest correlations of left atrial size were, in decreasing order, with body weight (r=0,44), body mass index (r=0,41), left ventricular mass (r=0,35). Correlations were not significant with mean arterial pressure (r=0,23).

Discusion

Left ventricular hypertrophy and left atrial enlargement are both manifestations of cardiac target organ damage in established hypertension.

More then 25 years ago Dunn et al found that hypertensive subjects with evidence of left atrial abnormality by electrocardiogram or left ventricular hypertrophy by either electrocardiogram or chest roentgenogram had significantly greater left atrial indexes (left atrial size/body surface area) than normotensive subjects /4/. In an early echocardiographic study, Savage et al. found left atrial enlargement in only5% hypertensive patients /5/. Miller et al in an evaluation of 14 hypertensive and 10 normotensive subjects with normal coronary angiography, demonstrated significantly increased left atrial dimension and left atrial index among the hypertensive subjects/6/. A study by Pearson et al of 144 participants of the Systolic Hypertension in the Elderly Program (SHEP) trial and 55 age-matched normotensive control subjects found significantly increased left atrial index (left atrial size/body surface area) in the hypertensive group /7/.

What is the mechanism of association between arterial hypertension and left atrial enlargement?

Eleveted systolic or pulse pressure may directly promote atrial dilatation. More reports demonstrated left atrial enlargement to be associated both with the duration of elevated blood pressure and with the level of systolic pressure in a general population /8-10/. The increase in left atrial size in the hypertensive patient may reflect other factors associated with increased systolic and pulse pressure. Left atrial enlargement in hypertensive patients can be secondary both to changes in systolic and diastolic left ventricular function. The left atrial enlargement has been regarded as an early clinical sign of reduced diastolic left ventricular function in patients with normal systolic function /9/. In recent investigation O Sulivan et al demonstrate that association of blood pressure and left atrial enlargement are mediated trough the more clearly defined association of hypertension with left ventricular hypertrophy /11,12/.

In presented study we evaluated subjects with moderate arterial hypertension. Level of arterial pressure evaluated patient is ansver way we did not find asssociation between arterial hypertension and left atrial enlargement.

Visari et al in the part of Framingham Study based on a large closely followed population demonstrate that blood pressure and left ventricular mass were both correlated with left atrial enlargement, although on multivariable analysis most of the variance in left atrial dimension was explained by left ventricular mass and body weight /8/.

Gerts et al found independent associations of obesity and left ventricular hypertrophy with left atrial enlargemen /9/

Similar to arterial hypertension, isolated chronic obesity (without arterial hypertension)is associated with cardiac alterations This association has been recognized since early in the last century and has been attributed to the chronic increase in

both pressure and volume overload that reduce the contractile reserve of the left ventricle in obese patients /13/.

Morricone at al. faund that the obese patients had a significantly larger internal diastolic left ventricular diameter, a thicker end-diastolic septum and posterior wall a greater indexed left ventricular mass , a higher atrial diastolic filling wave velocity, a lower ratio between early and atrial diastolic filling wave velocities and a prolonged isovolumic relaxation time. End-diastolic septum and posterior wall thickness and the left ventricular mass were significantly greater in patients with a The morphological and functional echocardiographic alterations usually found in normotensive obese patients closely correlate with the amount of intra-abdominal fat deposition /14/.

The present study evaluated that obesity is the most important predictor of left atrial enlargement

Obesity has been shown to be both an independent direct risk factor for cardiovascular disease and an indirect risk factor because of its effects on hypertension, diabetes, and hyperlipidemia /15/.

Combination of factors including overactivity of the sympathetic nervous system , insulin resistance, and abnormalities in vascular structure and function may contribute to obesity-related hypertension /16/. Together, arterial hypertension and obesity are strongest predictors of changes of cardiovascular structure.

The left atrial size was significantly associated with the risk for stroke /17/. The mechanisms of the increased risk of stroke and death in subjects with left atrial enlargement are incompletely understood. Left atrial dilation promotes stasis of blood, which in turn predisposes to thrombus formation and the potential for embolization. The thrombogenicity of left atrial dilation is supported by transesophageal echocardiography studies that found that left atrial dilation was associated with spontaneous echocardiographic contrast, left atrial thrombus, and embolic events /18/. New chelange is to know if reduction of left atrial size was associated with decrease in prevalence of stroke.

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