„Az artériás stiffness vizsgálatának története Magyarországon

Az elmúlt 10 év eredményei a hazai és nemzetközi kutatások tükrében”

*Hotel NOVOTEL BUDAPEST DANUBE*****

(1027 Budapest, Bem rakpart 33-34.)

2018. május 04.



MAGYAR ARTÉRIÁS STIFFNESS TÁRSASÁG

PROGRAM
és
TUDOMÁNYOS KÖZLEMÉNYEK GYŰJTEMÉNYE

Igen tisztelt Kollégák, igen tisztelt Hölgyeim és Uraim!

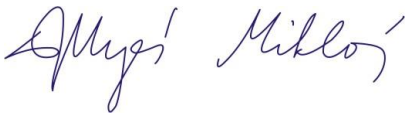
Jóllehet mindössze néhány hónap telt el múlt évi sikeres kongresszusunk óta, ezennel mégis újabb, jelentős rendezvényre invitáljuk Önöket a Magyar Artériás Stiffness Társaság nevében!

E soron kívüli rendezvénynek egy nagyon örömteli tény adja alapját. Nevezetesen az, hogy Magyarország az artériás stiffness, az artériás funkció vizsgálatnak a területén a nemzetközi kutatások és publikációk élvonalába került az eltelt bő évtized során. Ennek a nagyszerű eredménynek az eléréséhez nagymértékben hozzájárult, hogy immáron több mint egy évtizede hazai fejlesztésű és gyártású, nemzetközileg is elismert, klinikailag validált vizsgáló módszerrel rendelkezünk. Lehetővé vált az artériás funkció (stiffness) gyors, kiválóan reprodukálható, egyszerű, non-invazív vizsgálata, amellyel a hazai kutatók nemzetközi viszonylatban is elsőkként éltek, és az eltelt évek során kiválóbbnál kiválóbb tudományos eredmények születtek meg.

Mindezek alapján elérkezett az ideje annak, hogy a hazai orvostudományi közvélemény előtt összefoglaljuk az összességében igen magas impakt faktort reprezentáló tudományos közleményeket az egyes intézetek vezető szakembereinek közreműködésével. E tekintetben külön köszönettel tartozunk ***Soltész Pál*** professzor úrnak, a rendezvény ötletgazdájának, aki az *„Artériás stiffness gyulladásos vasculopathiákban”* című összefoglaló előadásában mutatja be sok éves munkájuk során összegyűlt eredményeit. ***Cziráki Attila*** professzor úr *az artériás stiffness kardiovaszkuláris betegekben* történő vizsgálatáról prezentálja egy évtizedes tapasztalatait. ***Nemes Attila*** professzor úr a Szegedi Kardiológiai Központban elért tudományos eredményeiket ismerteti *az artériás tágulékonyság* vizsgálatával kapcsolatban. Jómagam pedig a hazai módszer egyedi, eredeti működési elvéről és annak validációjáról számolok be.

A magyar műszer a neves hazai intézetek mellett azonban megtalálható a világ számos vezető kutatóintézetében is. Ennek köszönhetően jelentős számú külhoni publikáció látott napvilágot, amelyekben a magyar vizsgáló módszert alkalmazták. Ebben a tekintetben kiemelkedik ***Kennedy Cruickshank*** professzor az *Artery Society* jelenlegi elnökének munkássága, aki *a magyar műszerrel végzett nemzetközi kutatási eredmények*et foglalja össze.

Rendezvényünk segítségével tiszta, kizárólag tudományos evidenciákon alapuló, szubjektív megfontolásoktól mentes képet szeretnénk kialakítani az immáron nagy sikert befutott úttörő hazai módszerről, bemutatva az alkalmazásával szerzett széleskörű és nagy jelentőségű ismereteket.





Dr. Illyés Miklós
a MAST elnöke

Dr. Hidvégi Erzsébet
a MAST főtitkára

TUDOMÁNYOS PROGRAM

09:00 – 10:00	Regisztráció (ingyenes, de előzetes regisztráció szükséges)
09:00 – 09:40	**Nemzetközi sajtótájékoztató**
10:00 – 10:30	**Megnyitó, köszöntések**
10:40 – 11:10	**International studies with the Arteriograph - and clues to what T2 diabetes really is?** *Prof. Kennedy J. Cruickshank, London, UK* President of the Artery Society 2016-2018
11:10 – 11:40	**A legelső oscillometriás módszer az artériás stiffness vizsgálatára. Az Arteriográf és klinikai validitása** *Dr. Illyés Miklós PhD, címzetes egyetemi docens* Szívgyógyászati Klinika, PTE, Pécs
11:40 – 12:10	**Artériás stiffness gyulladásos vasculopathiákban** *Prof. Dr. Soltész Pál, az MTA doktora* III. Belgyógyászati Klinika, DEOEC, Debrecen
12:10 – 12:40	**Az artériás stiffness vizsgálata kardiovaszkuláris betegekben. Egy évtizedes tapasztalatok** *Prof. Dr. Cziráki Attila PhD* Szívgyógyászati Klinika, PTE, Pécs
12:40 – 13:10	**Tudományos eredményeink az artériás tágulékonyság vizsgálatával kapcsolatban a Szegedi Kardiológiai Központban (1999-2018)** *Prof. Dr. Nemes Attila, az MTA doktora* II. sz. Belgyógyászati Klinika és Kardiológiai Központ, SZTE, Szeged
13:10 – 13:30	Zárszó
13:30 –	Állófogadás

HUNGARY ARTERIAL STIFFNESS MEETING

Prof JK Cruickshank

This review will cover aspects of our work with the Arteriograph over the last 10 years. I will report on our validation, or better, calibration, compared with MRI and other devices where possible. The work covers data during my time in Manchester UK and now in London particularly in different ethnic groups and in different settings and medical conditions from a little experience in children, more in young and then older adults, and those with endocrine problems, later depression, and recently in 2 randomised trials of treatment in Type 2 diabetes and in pregnancy, as recently published.

Kennedy Cruickshank, President of the Artery Society, but here entirely in his own capacity

A NEW OSCILLOMETRIC METHOD FOR ASSESSMENT OF ARTERIAL STIFFNESS: COMPARISON WITH TONOMETRIC AND PIEZO-ELECTRONIC METHODS

Baulmann J, Schillings U, Rickert S, Uen S, Düsing R, Illyes M, Cziraki A, Nickering G, Mengden T.

Introduction: Pulse wave velocity (PWV) and augmentation index (AIx) are parameters of arterial stiffness and wave reflection. PWV and AIx are strong indicators for cardiovascular risk and are used increasingly in clinical practice. Previous systems for assessment of PWV and AIx are investigator dependent and time consuming. The aim of this study was to validate the new oscillometric method (Arteriograph) for determining PWV and AIx by comparing it to two clinically validated, broadly accepted tonometric and piezo-electronic systems (SphygmoCor and Complior).
Design and method: PWV and AIx were measured up to five times in 51 patients with the SphygmoCor, Complior and Arteriograph. In 35 patients, the measurements were repeated after 1 week in a second session using the same protocol.
Results: The correlations of the PWV as assessed with the Arteriograph with the values obtained using the SphygmoCor ($r = 0.67$, $P < 0.001$) and the Complior ($r = 0.69$, $P < 0.001$) were highly significant. Variability and reproducibility for PWV were best for the Arteriograph, followed by Complior and SphygmoCor. AIx (SphygmoCor versus Arteriograph) were very closely correlated ($r = 0.92$, $P < 0.001$).
Perspectives: The Arteriograph is a new, easy-to-use and time-effective method for assessing arterial stiffness and wave reflection.

J Hypertens. 2008 Mar;26(3):523-8. doi: 10.1097/HJH.0b013e3282f314f7.

PMID: 18300864
DOI: 10.1097/HJH.0b013e3282f314f7
[Indexed for MEDLINE]

A LEGELSŐ OSCILLOMETRIÁS MÓDSZER AZ ARTÉRIÁS STIFFNESS VIZSGÁLATÁRA. AZ ARTERIOGRÁF ÉS KLINIKAI VALIDITÁSA

Illyés Miklós

2001 és 2004 között nagyszabású kutatási projektet indítottunk annak vizsgálatára, hogy a felkarra helyezett mandzsettában vérnyomásméréskor keletkező oszcillációs jeleknek van-e információ tartalma a brachiális vérnyomáson túl a központi hemodinamikára és esetleg az artériás stiffness-re nézve. Jelentős mennyiségű (mintegy másfél millió) oszcillációs görbét gyűjtöttünk össze, amelynek analízésével (Kohonen féle módszer) egyértelművé vált, hogy nyomáslépcsőnként jelentősen eltérő alakú oszcillációs jelek észlelhetők, mégis el lehet különíteni a cardiovascularis megbetegedésben szenvedő és az attól mentes csoportok görbéit egymástól. További kutatás volt szükséges ahhoz, hogy meghatározzuk, melyik nyomástartományban keletkeztek azok a jelek, amelyek a releváns információt hordozták. Eredményeink alapján egyértelművé vált, hogy az ún. szupraszistolés tartományban keletkező jelek hordozzák a centrális nyomás és keringési információkat, mivel ebben a tartományban a direkt és a reflektált szisztolés nyomáshullám markánsan elkülönül egymástól. Ez lehetővé tette, hogy a centrális vérnyomás, az augmentációs index és az aorta pulzushullám terjedési sebesség értékeit egy felkarra felhelyezett mandzsettával egyszerűen és gyorsan meg tudjuk határozni. Eredményeinket szabadalmaztattuk és publikáltuk, így 2005-ben egy új orvosdiagnosztikai műszer osztály született, az ún. oszcillometriás, okkluzív, szupraszisztólés módszer, az Arteriograph.

Az eltelt több mint egy évtized alatt a módszer nemzetközi elfogadottságot nyert. Jelneleg mintegy 2000 Arteriograph szolgálja a kutatást és a betegellátást szerte a világon, amelyek közül jelentőségüknél fogva külön említést érdemel az Oxfordi és a Cambridge-i Egyetem, a King's College London, a Karolinska több intézete, valamint a berlini Charité. Hazánkban is csaknem mindegyik orvosegyetem rendelkezik ezzel a műszerrel, amelynek első invazív validációját a Pécsi Tudományegyetem Szívgyógyászati Klinikáján, valamint a Római La Sapienza Egyetemen végezték el és közölték 2010-ben. A Pubmed adatbázisban az Arteriograph kulcsszó alapján kétszáz fölötti közlemény található, amelyhez a hazai kutatóközpontok is több tucat közleménnyel járultak hozzá. Az eltelt több, mint 10 év történetét értékelve megalapozottan állíthatjuk, hogy Magyarország az Arteriograph felfedezésével, valamint az alkalmazásából származó elméleti és gyakorlati eredmények segítségével nemzetközi értelemben is élenjáró pozíciót vívott ki az artériás funkció (stiffness) non-invazív vizsgálatának területén.

INVASIVE VALIDATION OF A NEW OSCILLOMETRIC DEVICE (ARTERIOGRAPH) FOR MEASURING AUGMENTATION INDEX, CENTRAL BLOOD PRESSURE AND AORTIC PULSE WAVE VELOCITY

Iván G. Horváth, Ádám Németh, Zsófia Lenkey, Nicola Alessandri, Fabrizio Tufano, Pál Kis, Balázs Gaszner, Attila Cziráki

Background: The importance of measuring aortic pulse wave velocity (PWVao), aortic augmentation index (Aix) and central systolic blood pressure (SBPao) has been shown under different clinical conditions; however, information on these parameters is hard to obtain. The aim of this study was to evaluate the accuracy of a new, easily applicable oscillometric device (Arteriograph), determining these parameters simultaneously, against invasive measurements.
Methods: Aortic Aix, SBPao and PWVao were measured invasively during cardiac catheterization in 16, 55 and 22 cases, respectively, and compared with the values measured by the Arteriograph.
Results: We found strong correlation between the invasively measured aortic Aix and the oscillometrically measured brachial Aix on either beat-to-beat or mean value per patient basis ($r = 0.9$, $P < 0.001$; $r = 0.94$, $P < 0.001$), which allowed the noninvasive calculation of the aortic Aix without using generalized transfer function. Similarly strong correlation ($r = 0.95$, $P < 0.001$) was found between the invasively measured and the noninvasively calculated central SBPao; furthermore, the BHS assessment of the paired differences fulfilled the 'B' grading. The PWVao values measured invasively and by Arteriograph were 9.41 ± 1.8 m/s and 9.46 ± 1.8 m/s, respectively (mean ± SD); furthermore, the Pearsons correlation was 0.91 ($P < 0.001$). The limits of agreement were 11.4% for aortic Aix and 1.59 m/s for PWVao.
Conclusion: Aix, SBPao and PWVao, measured oscillometrically, showed strong correlation with the invasively obtained values. The observed limits of agreement are encouragingly low for accepting the method for clinical use. Our results suggest that the PWVao values, measured by Arteriograph, are close to the true aortic PWV, determined invasively.

COMPARISON OF AORTIC AND CAROTID ARTERIAL STIFFNESS PARAMETERS IN PATIENTS WITH VERIFIED CORONARY ARTERY DISEASE

Balázs Gaszner, Zsófia Lenkey, Miklós Illyés, Zsolt Sárszegi, Iván G. Horváth, Balázs Magyari, Ferenc Molnár*, Attila Cziráki

Background: Arterial stiffness parameters are commonly used to determine the development of atherosclerotic disease. The independent predictive value of aortic stiffness has been demonstrated for coronary events.
Hypothesis: The aim of our study was to compare regional and local arterial functional parameters measured by 2 different noninvasive methods in patients with verified coronary artery disease (CAD). We also compared and contrasted these stiffness parameters to the coronary SYNTAX score in patients who had undergone coronary angiography.
Methods: In this study, 125 CAD patients were involved, and similar noninvasive measurements were performed on 125 healthy subjects. The regional velocity of the aortic pulse wave (PWVao) was measured by a novel oscillometric device, and the common carotid artery was studied by a Doppler echo-tracking system to determine the local carotid pulse wave velocity (PWVcar). The augmentation index (AIx), which varies proportionately with the resistance of the small arteries, was recorded simultaneously.
Results: In the CAD group, the PWVao and aortic augmentation index (Alxao) values increased significantly (10.1 ± 2.3 m/sec and 34.2% ± 14.6%) compared to the control group (9.6 ± 1.5 m/sec and 30.9% ± 12%; $P < 0.05$). We observed similar significant increases in the local stiffness parameters (PWVcar and carotid augmentation index [Alxcar]) in patients with verified CAD. Further, we found a strong correlation for PWV and AIx values that were measured with the Arteriograph and those obtained using the echo-tracking method ($r = 0.57$, $P < 0.001$ for PWV; and $r = 0.65$, $P < 0.001$ for AIx values).
Conclusions: Our results indicate that local and regional arterial stiffness parameters provide similar information on impaired arterial stiffening in patients with verified CAD. © 2011 Wiley Periodicals, Inc.

This study was supported by the Hungarian National Research Foundation (OTKA) No.78480. The authors have no other funding, financial relationships, or conflicts of interest to disclose.

Comparison of aortic and carotid arterial stiffness parameters in patients with verified coronary artery disease Clin. Card. 2012; 35. (1) 26-31.

COMPARISON OF ARTERIAL STIFFNESS PARAMETERS IN PATIENTS WITH CORONARY ARTERY DISEASE AND DIABETES MELLITUS USING ARTERIOGRAPH

Zsófia Lenkey, Miklós Illyés, Renáta Böcskei, Róbert Husznai, Zsolt Sárszegi, Zsófia Meiszterics, Ferenc Molnár, Gábor Hild, Sándor Szabados, Attila Cziráki*, Balázs Gaszner*

Recently an expert consensus document advised to standardize user procedures and a new cut-off value for carotid-femoral pulse wave velocity in daily practice. Our aim was to observe aortic pulse wave velocity (PWVao) and augmentation index (AIXao) in two high cardiovascular risk groups: patients with verified coronary artery disease (CAD) or with type 2 diabetes mellitus (T2DM). We also aimed to determine the cut-off values for PWVao, AIXao in CAD and T2DM patients using oscillometric device (Arteriograph). We investigated 186 CAD and 152 T2DM patients. PWVao and AIXao increased significantly in the CAD group compared to the age-, gender-, blood pressure-, and heart rate-matched control group (10.2±2.3 vs. 9.3±1.5 m/s; pp).
When compared to the apparently healthy control subjects, T2DM patients had significantly elevated PWVao (9.7±1.7 vs. 9.3±1.5 m/s;p<0.001 and 34.9±14.6 vs. 31.9±12.8 %; p<0.05,respectively). When compared to the apparently healthy controlsubjects, T2DM patients had significantly elevated PWVao(9.7±1.7 vs. 9.3±1.5 m/s; p<0.05, respectively), however the AIXao did not differ significantly. The ROC-curves of CAD and healthy control subjects explored cut-off values of 10.2 m/s for PWVao and 33.23 % for AIXao. Our data provide supporting evidence about impaired arterial stiffness arameters in CAD and T2DM. Our findings encourage the implementation of arterial stiffness easurements by oscillometric method in daily clinical routin.

Physiol. Res. 63: 429-437, 2014

* The last two authors contributed equally.

AORTIC STIFFNESS MEASURED BY A NOVEL OSCILLOMETRIC METHOD INDEPENDENTLY PREDICTS CARDIOVASCULAR MORBIDITY AND MORTALITY: A STUDY OF 4146 SUBJECTS.

Kahan, P. Boutouyrie, A. Cziráki, M. Illyés, S. Laurent, F.T. Molnár, G. Schillaci, M. Viigimaa

Objective: Carotid-femoral pulse wave velocity (cfPWV) assessed by applanation tonometry evaluates aortic stiffness and predicts cardiovascular morbidity and mortality independently of classical CV risk factors. We studied the prognostic information provided by a novel and simpler oscillometric method, measuring aortic pulse wave velocity (PWVao) from a sole arm cuff.

Desing and method: We studied 4,146 subjects (51% women) aged 35-75 years, who attended voluntary health screening in Hungary. Oscillometric PWVao (Arteriograph, TensioMed Ltd, Budapest, Hungary) measurement was performed in addition to a medical history, physical examination, and laboratory tests. All events (all cause mortality, non-fatal myocardial infarction, and non-fatal stroke according to ICD codes) were provided by the Hungarian National Health Insurance Fund, which performed an independent statistical analysis. Cox regression analyses were used to identify predictive factors for a composite endpoint, combining above events.

Results: Mean age was 53 years, brachial blood pressure 136/82 mm Hg, and total cholesterol 5.2 mM. There were 16% smokers, 48% patients on cardiovascular medications and 8% on antidiabetic drugs; 10% had a previous cardiovascular hospitalization. There were 241 events (100 deaths, 56 non-fatal myocardial infarctions, and 86 non-fatal strokes) during a mean follow-up of 5.5 years. In univariate analysis, a 1.0 m/s increase in PWVao was associated with HR 1.49 [1.34–1.65], P<0.001, for the composite endpoint. PWVao independently predicted the composite outcome in the final model of multivariate analysis (HR = 1.14 [1.01-1.30]) adjusted for pulse pressure, ejection duration, male gender, age, concomitant cardiovascular disease and treatment with thrombocyte inhibitors (all P<0.05); body mass index, smoking, heart rate, blood pressure, augmentation index, diabetes, and cardiovascular drug therapy were all accounted for.

Conclusions: Aortic pulse wave velocity assessed by a simple oscillometric method using an arm cuff only independently predicted all cause mortality and major CV events in a large cohort of subjects attending health screening. Using a simpler oscillometric cuff method for assessing aortic stiffness may facilitate risk assessment in routine clinical practice.

J Hypertens. Volume 31, e-Supplement A, June 2013 ESH 2013 Abstract Book, e102

THE EFFECT OF PHYSICAL EXERCISE ON ARTERIAL STIFFNESS PARAMETERS IN YOUNG SPORTSMEN

László Rátgéber, Zsófia Lenkey, Ádám Németh, Erzsébet Hidvégi, Róbert Husznai, Zsófia Verzár, Miklós Illyés, József Bódis, Attila Cziráki

Objective: This study aimed to determine the effect of single-bout exercise on aortic stiffness parameters in young basketball players.
Method and results: A total of 108 young male subjects (mean age 14.2 ± 3.4 years) were enrolled into the study. Simultaneous measure- ment of aortic pulse wave velocity (PWVao) and augmentation index (Alxao) were performed with the oscillometric, occlusive device. Echocardiographic parameters of left ventricular systolic and diastolic function at rest were also measured in sportsmen. We did not find significant differences of resting PWVao in comparison with young sportsmen (S) and age-matched healthy volunteers (V): 5.82 ± 0.14 m/s vs 5.83 ± 0.12 m/s for S and V groups, respectively. The values of PWVao measured after dynamic exercise, isometric exercise, and rest were 8.0 ± 0.5 m/s, 5.86 ± 0.1 m/s and 5.82 ± 0.1 m/s, respectively. We confirmed that values after dynamic exercise are significantly different from those after isometric exercise ($P < 0.01$) and those after rest ($P < 0.01$). The Alxao values exhibited a considerable, but statistically non-significant, decrease during dynamic exercise in the three groups (11.7 ± 7% vs 3.8 ± 3% vs- 0.9 ± 0.9% for groups 1, 2, and 3, respectively).
Conclusion: We applied a feasible, clinically useful method which allowed us to measure changes in aortic PWV and Alx during acute, single-bout exercise on the basketball court in young sportsmen.

Acta Cardiol. 2015 Feb;70(1):59-65

EXPERIENCES AND MAJOR RESULTS IN THE INVESTIGATION OF ARTERIAL STIFFNESS PARAMETERS DURING ONE DECADE

Attila Cziráki, Erzsébet Hidvégi, Renáta Böcskei, Ádám Németh, Zsófia Lenkey, Róbert Husznai, Sándor Szabados, Balázs Gaszner, Miklós Illyés

Introduction: The overall goal of our investigations was to prove reliability, feasibility and usefulness of the new oscillometric device, to measure arterial stiffness parameters noninvasively in the clinical practice. Arterial stiffness parameters were used to identify preclinical organ damage, to determine cardiovascular (CV) risk in different diseases, and we also followed changes of similar stiffness parameters in young healthy volunteers due to age or physical exercise.

Method and patients: Serial measurements of stiffness parameters (aortic pulse wave velocity (PWVao), and aortic augmentation index (AIXao) were performed noninvasively, using Arteriograph (TensioMed Ltd., Budapest, Hungary). We determine first the reference values of PWVao and AIXao in a large (3374 subjects) healthy population aged between 3-18 years, to analyse the physiological background of the observed age-related changes. We also determined the effect of single-bout exercise on aortic stiffenes parameters in 108 young male subjects (mean age 14.2 ± 3.4 years). We investigated relationship between increased arterial stiffness and asymptomatic carotid atherosclerosis (ACA) furthermore, we compared central (ao) and local carotid (car) stiffness parameters in 361 patients.We also investigated the prognostic information provided by oscillometrically measured PWVao in 4146 healthy subjects during 5.5 years mean follow up period. In the clinical practice we first elaborate a novel method for the continuous, 24-hour ambulatory measurement of stiffness parameters and applied on patients with verified obsctructive sleep apnea syndrome (OSA).

Results: We found that mean PWV_{ao} values increased from 5.5±0.3 to 6.5±0.3 m/s ($P<0.05$) in boys and from 5.6±0.3 to 6.4±0.3 m/s ($P<0.05$) in girls. The increase, however, was not constant, and the values exhibited a flat period between the ages of 3 and 8 years in both sexes.Moreover, between the ages of 3 and 8 years, the brachial SBP and mean blood pressures increased continuously and gradually, whereas the PWV_{ao} remained unchanged. In young sportsman we found significant increase of PWVao which was measured after dynamic exercise compared to those values which were measured at rest (8.06 ± 0.55 m/s vs. 5.82 ± 0.14 m/s; p<0.001). In patients with ACA PWVao (9.3±1.6 vs 7.9±1.3 m/s, p<0.001) and AIXao (27.6±14.6 vs 24.1±14.1 %; p=0.118) were significantly different than subjects without ACA. In a stepwise logistic regression analysis PWVao (1.88 [1.44; 2.50], p<0.001) remained independently associated to ACA. PWVao was associated with a 1.49-fold increased risk for the primary composite endpoint non-fatal MI, stroke or all-cause mortality; the risk for all-cause mortality was increased 1.71-fold.

Conclusion: Our findings encourage to apply the single, serial and 24-hour measurements of arterial stiffness parameters in clinical practice in patients with CV diseases.

MKT – 2017

INFLUENCE OF BODY HEIGHT ON AORTIC SYSTOLIC PRESSURE AUGMENTATION AND WAVE REFLECTION IN CHILDHOOD

Erzsébet Valéria Hidvégi, Miklós Illyés, Molnár Ferenc, Attila Cziráki

The enhanced wave reflection in small children is a well-known phenomenon. It is explained on the basis of differences in the body height and the timing of wave reflection. This hypothesis still has not been proved directly. The aim of our study was to determine the reference values of aortic augmentation index (Aix(ao)) and the simultaneously measured return time of the systolic pulse wave (RT) in relation to the body height to test this hypothesis. Aix(ao) and RT were measured by Arteriograph in a healthy population aged 3-18 years (n = 4619, 2489 males). The Aix(ao) decreased with increasing age in boys from 18.6 ± 8.4% to 4.7 ± 4.3% and in girls from 22.3 ± 9.2% to 8.1 ± 5.1%, whereas the RT increased from 115.5 ± 16.3 ms to 166.7 ± 20.8 ms in boys and from 106.7 ± 21.9 ms to 158.1 ± 15.5 ms in girls. These changes were constant during childhood, but they slowed down after the onset of puberty. Because aortic pulse wave velocity (PWV(ao)) measured in the same population was unchanged during childhood, the increase of RT can only be explained by the increase of aortic length due to growth. In the puberty PWV(ao) starts increasing indicating that RT (Aix(ao)) does not follow the increase (decrease) of aortic length proportionally.

J Hum Hypertens. 2015 Aug;29(8):495-501. doi: 10.1038/jhh.2014.118. Epub 2014 Dec 11.

PMID: 25500901
DOI: 10.1038/jhh.2014.118
[Indexed for MEDLINE]

REFERENCE VALUES OF AORTIC PULSE WAVE VELOCITY IN A LARGE HEALTHY POPULATION AGED BETWEEN 3 AND 18 YEARS

Erzsébet Valéria Hidvégi, Miklós Illyés, Béla Benczúr, Renáta Böcskei, László Rátgéber, Zsófia Lenkey, Molnár Ferenc, Attila Cziráki

Objective: The measurement of aortic pulse wave velocity (PWV(ao)) is an accepted marker in stratifying individual cardiovascular risk in adults. There is an increasing volume of evidence concerning impaired vascular function in different diseases in paediatric populations, but, unfortunately, only a few studies are available on the measurement of normal PWV(ao) values in children. The aim of our study was to determine the reference values of PWV(ao) in a large healthy population using a newly developed technique.
Methods: Three thousand, three hundred and seventy-four healthy individuals (1802 boys) aged 3-18 years were examined by an invasively validated, occlusive, oscillometric device.
Results: The mean PWV(ao) values increased from 5.5 ± 0.3 to 6.5 ± 0.3 m/s ($P < 0.05$) in boys and from 5.6 ± 0.3 to 6.4 ± 0.3 m/s ($P < 0.05$) in girls. The increase, however, was not constant, and the values exhibited a flat period between the ages of 3 and 8 years in both sexes. The first pronounced increase occurred at the age of 12.1 years in boys and 10.4 years in girls. Moreover, between the ages of 3 and 8 years, the brachial SBP and mean blood pressures increased continuously and gradually, whereas the PWV(ao) remained unchanged. By contrast, beyond the age of 9 years, blood pressure and aortic stiffness trends basically moved together.
Conclusion: Our study provides the largest database to date concerning arterial stiffness in healthy children and adolescents between the ages of 3 and 18 years, and the technology adopted proved easy to use in large paediatric populations, even at a very young age.

J Hypertens. 2012 Dec;30(12):2314-21. doi: 10.1097/HJH.0b013e328359562c.

A VESETRANSZPLANTÁCIÓ POZITÍV HATÁSAI A BETEGEK ANGIOLÓGIAI STÁTUSZÁRA. AZ ARTÉRIÁS FUNKCIÓ (STIFFNESS) NONINVAZÍV MÉRÉSÉNEK LEHETSÉGES SZEREPE AZ ELŐREJELZÉSBEN

Kovács Dávid Ágoston, Asztalos László, Laczik Renáta, Fedor Roland, Szabó László, †Lőcsey Lajos, Soltész Pál

Bevezetés: A cardiovascularis betegségek kialakulása szempontjából a krónikus veseelégtelenség a legfőbb kockázati tényezők egyike. Annak ellenére, hogy a krónikus dialíziskezeléssel szemben a vesetranszplantált betegek életkilátásai és életminősége jelentősen jobb, a jó graftműködés mellett bekövetkezett halálozás leggyakrabban cardiovascularis eredetű. A komplex részfolyamatok érelmeszesedésre gyakorolt hatása tetten érhető a megszokott diagnosztikus eszközökkel, és noninvazívan mérhető az artériás stiffness (érfali merevség) vizsgálatával.
Célkitűzés: Artériás funkciós paraméterek változásának noninvazív klinikai vizsgálata közvetlenül a vesetranszplantációt követően.
Módszer: Prospektív, követéses vizsgálatban 17 (8 nő, 9 férfi; életkor: 46,16 ± 12,19 év) cadavervese-transzplantáción átesett beteg noninvazív módon rögzített artériás funkciós paramétereit, laboreredményeit, klinikai állapotát vizsgálták a perioperatív időszakban, abból a célból, hogy észlelhető-e már a műtét után közvetlenül mérhető változás. A méréseket a transzplantációs műtétet megelőzően (1. mérés), majd azt követően 24 óra múlva (2. mérés), végül hetente egyszer (3–4. mérés) végezték standard körülmények között. Korrelációanalízist végeztek a stiffness és a hagyományos laboratóriumi paraméterek között. A stiffnessparaméterek rögzítésére az oszcillometriás elven működő, TensioMed Arteriográfot használták. Az arteria carotisok és a kardiális státusz rögzítését ultrahanggal (bal kamrai ejekciós frakció, bal kamra falvastagsága, a diasztolés diszfunkciót jelző E/A hányados, jobb kamrai nyomás) készített leletek alapján végezték. A statisztikai analíziseket Windows StatSoft 7.0 szoftver segítségével végezték. Statisztikai különbözőséget állapítottak meg $p<0,05$ szignifikanciaszint esetén.
Eredmények: A posztoperatív időszakban az augmentációs index és a pulzushullám-terjedési sebesség szignifikáns csökkenését észlelték.
Következtetések: Eredményeik szerint az artériás stiffness monitorozása transzplantált betegeik körében alkalmasnak tűnik a globális cardiovascularis kockázat megítélésére. A végstádiumú veseelégtelenségben szenvedő betegek artériás funkciós tulajdonságai már a műtétet követő napokban noninvazív eszközökkel is kimutathatóan javulnak. Az artériás stiffness rendszeres monitorozása a műtétet követő felülvizsgálatok alkalmával lehetővé teheti a korai és célzott kezelést, hozzájárulva a veseátültetés hosszú távú eredményeinek további javulásához.

ORVOSI HETILAP 157:(24) pp. 956-963. (2016)

AZ ARTÉRIÁS STIFFNESS PATOFIZIOLÓGIÁJA, MÉRÉSI LEHETŐSÉGEI ÉS PROGNOSZTIKAI SZEREPE

Timár Orsolya, Soltész Pál

Az elmúlt években hazánkban is az érdeklődés középpontjába került a keringési rendszer új jellemzője, az artériás stiffness (az artériafal merevsége, csökkent érfali tágulékonyság). A *Hypertonia és Nephrologia* már 2005-ben összefoglaló közleményben foglalkozott az érfali tágulékonyság jelentőségével, két mérési paraméterrel (pulzushullám-terjedési sebesség és augmentációs index), valamint a stiffness és a hagyományos cardiovascularis kockázati tényezők összefüggésével. Az utóbbi években lezárult mind több epidemiológiai tanulmány támasztja alá, hogy az artériás stiffness mutatói nemcsak egyszerű mérési eredmények, hanem a célszervkárosodással, halálozással is összefügghetnek. Az alábbiakban artériás stiffness patomechanizmusának és mérési módszereinek ismertetését követően összefoglaljuk a legfontosabb, már lezárult epidemiológiai vizsgálatok eredményeit, és röviden kitérünk a kóros érfali tágulékonyság terápiás befolyásolására is.

HYPERTONIA ÉS NEPHROLOGIA 14:(1) pp. 29-40. (2010)

ARTÉRIA BRACHIALIS FLOW-MEDIÁLT VASODILATÁCIÓ, CAROTIS INTIMA-MEDIA VASTAGSÁG ÉS AUGMENTÁCIÓS INDEX (AIX) ÖSSZEHASONLÍTÓ VIZSGÁLATA

Dér Henrietta, Kerekes György, Veres Katalin, Szomják Edit, Soltész Pál

A szerzők prospektiv metodikai vizsgálatot indítottak azzal a kérdésfelvetéssel, hogy az artéria brachialis flow-mediált és nitrát-mediált vasodilatációjának mértéke és az artéria carotis communis intima-media vastagsága milyen összefüggést mutat a TensioClinic arteriográffal mért augrnentációs indexszel és a pulzushullám terjedési sebességgel. 90 különböző típusú vasculopathiás eltérést mutató betegnél (primer antifoszfolipid szindróma, hypertonia, diabetes mellitus, scleroderma és rheumatoid arthritis) végezték el a fenti paraméterek meghatározását. Az endothel funkciós mérésekek Hewlett Packard Sonos 55OO ultrahangkészülékkel (l0 MHz-es lineáris transducerrel) történtek, a mérési eredmények kiértékelése digitalizálva, AVITA kiértékelő szoftverrel zajlott. A mérési eredmények alapján az augmentációs index erős lineáris 6s szignifikáns korrelációt mutatott a flow-mediált vasodilatációval ($R = -0,4413$; $p<0,001$), míg közepesen erős szignifikáns összefüggést a carotis intima-media vastagsággal ($R = 0,3013$, $p = 0,013$). Gyengébb korrelációs koefficiensű, de szignifikáns összefüggés mutatható ki a pulzushullám terjedési sebesség és a flow-mediált vasodilatáció ($R = -0,3207$; $p = 0,008$), valamint az artéria carotis intima-media vastagság között ($R = 0,2829$; $p<0,0001$). Eredményeink szerint a flow-mediált vasodilatáció károsodásának mértéke erős korrelációt mutat a TensioClinic arteriográffal számított, érfali merevségre jellemző augmenticiós indexszel és a pulzushullám terjedési sebességgel.

ÉRBETEGSÉGEK 3: pp. 79-86. (2006)

THREE-YEAR LONGITUDINAL CLINICAL TRIAL OF ARTERIAL FUNCTION ASSESSED BY A OSCILLOMETRIC NON-INVASIVE METHOD IN COMPARISON WITH CAROTID SCLEROSIS AND TRANSFERRIN KIDNEY-TRANSPLANTED PATIENTS

Dávid Kovács, Lajos Lőcsey, Renáta Laczik, László Szabó, Lajos Zsom, Krisztina Kabai, Roland Fedor, Balázs Nemes, László Asztalos, Pál Soltész

Chronic kidney disease remains one of the main risk factors of cardiovascular disease. However, patients with kidney transplantation have better life expectancy and better quality of life compared with patients on dialysis. In patients with a well-functioning graft, the main cause of death is cardiovascular in origin. Metabolic pathways have complex effects on arterial function that can be monitored by conventional ultrasonography and with the assessment of arterial stiffness by oscillometric non-invasive technique. Forty-one primer cadaver kidney transplanted patient were involved in a 3-year longitudinal clinical trial (21 female, 20 male; average age, 40.16 +- 12.56 years). Arterial stiffness parameters referring to rigidity of the arterial wall (pulse wave velocity [PWV], augmentation index, and pulse pressure) were investigated. Correlation between stiffness, and laboratory parameters (serum creatinine, urea, hemoglobin, albumin, cholesterine, triglycerides, transferrin, uric acid, glomerular filtration rate, and C-reactive protein) were analyzed. A non-invasive oscillometric method Tensiomed Arteriograph was applied to assess the arterial stiffness parameters. Statistical analysis was performed with the use of Statistica for Windows, version 8.0. A value of $P<.05$ was considered statistically significant for all statistical tests. We found a positive correlation between PWV and left ventricular wall thickness and a negative correlation between PWV and ejection fraction. We also found a positive significant correlation between serum level of transferrin and PWV. There was simultaneous significant progression concerning PWV and carotid artery sclerosis in a 3-year follow-up. There was no fatal cardiovascular event during the study period among our patients. All of our patients involved in this study are still alive. Our findings suggest that arterial stiffness monitoring is a reliable method to assess global cardiovascular risk among kidney-transplanted patients. The oscillometric method is convenient, fast, painless technique to monitor arterial function, which, in the case of pathological findings, proposes more frequent cardiovascular control.

TRANSPLANTATION PROCEEDINGS 46:(6) pp. 2168-2170. (2014)

IMPAIRED ENDOTHELIAL FUNCTION IN PATIENTS WITH UNDIFFERENTIATED CONNECTIVE TISSUE DISEASE: A FOLLOW-UP STUDY

Renata Laczik, Pal Soltesz, Peter Szodoray, Zoltan Szekanecz, Gyorgy Kerekes, Gyorgy Paragh, Eva Rajnavölgyi, Gyorgy Abel, Gyula Szegedi, Edit Bodolay

Objective. In this study the alteration of endothelial function, arterial stiffness and autoantibodies was investigated in patients with UCTD.
Methods. Thirty-one patients with UCTD were included in this prospective study. All the patients remained in the UCTD stage during the average 3.8 years follow-up period. The onset of UCTD was denoted as UCTD1, while the end of the follow-up period was called UCTD2. Flow-mediated vasodilation (FMD), carotid intima_media thickness (IMT), autoantibodies [such as anti-SSA, anti-SSB, anti-DNA, anti-RNP, anti-CCP, aCL, anti-oxidized low-density lipoprotein (oxLDL) and AECA], von Willebrand factor antigen, thrombomodulin (TM), endothelin 1 (ET-1) and lipid parameters were measured. Results. In the UCTD1 stage, high-sensitivity CRP (hsCRP) and endothelial cell activation and/or damage markers such as TM, ET-1 and AECA levels were significantly higher compared with controls (controls vs UCTD1: hsCRP, $P<0.0001$; TM, $P = 0.001$; ET-1, $P<0.0001$). In the UCTD2 stage, the carotid IMT increased (UCTD1 vs UCTD2, $P = 0.01$) and FMD further deteriorated (UCTD1 and UCTD2, $P = 0.001$). In UCTD2 there was a close correlation between the carotid IMT, and duration of the disease ($r = 0.612$, $P<0.001$), the level of TM ($r = 0.673$, $P<0.001$) and anti-oxLDL ($r = 0.800$, $P<0.001$). Conclusion. Our data suggest that the presence of inflammation and autoantibodies provoke endothelial cell activation and/or injury in UCTD patients. The persistent endothelial dysfunction may provoke the development of atherosclerosis. FMD was found to be the most sensitive marker for arterial stiffness, and the increase of IMT clearly indicated the existence of preclinical atherosclerosis in UCTD patients.

RHEUMATOLOGY (UNITED KINGDOM) 53:(11) pp. 2035-2043. (2014)

NONINVASIVE PERIOPERATIVE MONITORING OF ARTERIAL FUNCTION IN PATIENTS WITH KIDNEY TRANSPLANTATION

Dávid Kovács, Lajos Lőcsey, László Szabó, Roland Fedor, Renáta Laczik, László Asztalos, Pál Soltész

Development of atherosclerosis is accelerated in kidney transplant recipients. Impaired metabolic pathways have a complex effect on the arterial wall, which can be measured by noninvasive techniques. Few data are available on the change of stiffness parameters in the postoperative course, so in this study we analyzed the stiffness parameters of kidney transplant recipients during the perioperative period. Seventeen successful primary kidney transplant patients with uneventful postoperative period (7 woman, 10 men; 46.16 +- 12.19 years) were involved in our short-term prospective longitudinal study. We analyzed the correlation between noninvasively assessed stiffness parameters (pulse wave velocity [PWV], augmentation index [AIx], pulse pressure [PP], systolic area index, diastolic area index, diastolic reflection area), ankle-brachial index (ABI), and laboratory parameters (creatinine, glomerular filtration rate, urea, haemoglobin, C-reactive protein). Stiffness parameters were measured with a Tensiomed Arteriograph. These parameters were assessed before the transplantation, and 24 hours, and 1 and 2 weeks after surgery under standard conditions. We found that creatinine (P =.0008) and C-reactive protein (P=.006) serum levels decreased, and glomerular filtration rate increased significantly (P=.0005). We revealed that PWV (P =.0075) and AIx (P=.013) improved significantly. There was no significant change in ABI, PP, and the other monitored parameters. Along with the available data in the literature, our findings suggest that kidney transplantation has a positive effect on the arterial function.

TRANSPLANTATION PROCEEDINGS 45:(10) pp. 3682-3684. (2013)

ROSUVASTATIN IMPROVES IMPAIRED ENDOTHELIAL FUNCTION, LOWERS HIGH SENSITIVITY CRP, COMPLEMENT AND IMMUNCOMPLEX PRODUCTION IN PATIENTS WITH SYSTEMIC SCLEROSIS - A PROSPECTIVE CASE-SERIES STUDY

Orsolya Tímár, Zoltán Szekanecz, György Kerekes, Judit Végh, Anna V Oláh, Gábor Nagy, Zoltán Csiki, Katalin Dankó, Szilvia Szamosi, Ágnes Németh, Pál Soltész, Gabriella Szűcs

Introduction: We studied the effect of rosuvastatin on endothelial and macrovascular function, cardiovascular risk factors and the complement pathway in patients with systemic sclerosis (SSc). Methods: Altogether 28 patients with SSc underwent laboratory and complex vascular assessments before and after six months of 20 mg rosuvastatin treatment. Flow-mediated dilation (FMD) of the brachial artery, as well as carotid artery intima-media thickness (ccIMT), carotid-femoral and aorto-femoral pulse wave-velocity (PWV) were analyzed by ECG-synchronized ultrasound. Ankle-brachial index (ABI) was determined by Doppler, and forearm skin microcirculation was assessed by Laser Doppler perfusion monitoring. Results: Brachial artery FMD significantly improved upon rosuvastatin therapy (2.2% ± 3.3% before versus 5.7% ± 3.9% after treatment, P = 0.0002). With regard to patient subsets, FMD significantly improved in the 21 lcSSc patients (from 2.1% to 5.6%, P = 0.001). In the seven dcSSc patients, we observed a tendency of improvement in FMD (from 3% to 6%, P = 0.25). Changes in PWV, ccIMT and ABI were not significant. Mean triglyceride (1.7 ± 0.97 versus 1.3 ± 0.46 mmol/l, P = 0.0004), total cholesterol (5.3 ± 1.6 mmol/l versus 4.2 ± 1.3 mmol/l, P = 0.0003), low density lipoprotein cholesterol (3.0 ± 1.3 versus 2.2 ± 1.0 mmol/l, P = 0.005) and C-reactive protein levels (CRP) (5.1 ± 5.2 versus 3.4 ± 2.7, P = 0.01) levels significantly decreased after rosuvastatin treatment. Mean C3, C4 and IC levels also decreased significantly as compared to pretreatment values. Conclusions: Six-month rosuvastatin therapy improves endothelial function and lowers CRP, C3, C4 and IC levels indicating possible favourable effects of this statin on the cardiovascular and immune system in SSc.

ARTHRITIS RESEARCH & THERAPY 15:(5) Paper R105. (2013)

PROSPECTIVE STUDY OF CHANGES IN ARTERIAL STIFFNESS AMONG KIDNEY-TRANSPLANTED PATIENTS

Dávid Kovács, László Szabó, Roland Fedor, Renáta Laczik, Pál Soltész, Lajos Lőcsey, László Asztalos

Background. Chronic kidney disease is one of the main risk factors for cardiovascular disease. Changes in stiffness parameters can predict the higher risk of the development of cardiovascular disease. Methods. Cadaveric donor kidney transplant patients (n = 184) were followed in a cross-sectional single-center study. Arterial stiffness parameters were measured by arteriography. We analyzed the correlation between stiffness parameters and immunosuppressive therapy, the main operation parameters, patient age, elapsed time since transplantation, carotid artery stenosis, and septual wall thickness. We enrolled 24 patients in a 3-year longitudinal study to analyze changes in stiffness parameters. Results. Our cross-sectional study showed pulse wave velocity (PWV) to be significantly related to the age of the patient (P = .0001; r = 0.41). There was no significant correlation between the stiffness parameters and type or dosage of immunosuppressive drugs and number of transplantations. We noted significant correlations between pulse pressure (PP) and pulse wave velocity (PWV), and augmentation index (AI) (P = .01). Patients with abnormal PWV (>12 m/s) showed significantly higher systolic blood pressures, body mass indexes, PP, and AI (P < .01). Our 3-year longitudinal study revealed a significant elevation in PWV. Conclusions. Improving endothelial function and prevention of atherosclerosis may help to reduce cardiovascular complications. Among chronic kidney disease patients, early transplantation is a possible way to prevent cardiovascular events. It is better to perform the transplantation at as early an age as possible.

TRANSPLANTATION PROCEEDINGS 43:(4) pp. 1252-1253. (2011)

COMPARATIVE ASSESSMENT OF VASCULAR FUNCTION IN AUTOIMMUNE RHEUMATIC DISEASES: CONSIDERATIONS OF PREVENTION AND TREATMENT

Pál Soltész, György Kerekes, Henriett Dér, Gabriella Szücs, Sándor Szántó, Emese Kiss, Edit Bodolay, Margit Zeher, Orsolya Timár, Péter Szodoray, Gyula Szegedi, Zoltán Szekanecz

Numerous autoimmune-inflammatory rheumatic diseases have been associated with accelerated atherosclerosis or other types of vasculopathy leading to increased cardio- and cerebrovascular disease risk. Traditional risk factors, as well as the role of systemic inflammation including cytokines, chemokines, proteases, autoantibodies, adhesion receptors and others have been implicated in the development of these vascular pathologies. The characteristics of vasculopathies may significantly differ depending on the underlying disease. While classical accelerated atherosclerosis has been associated with rheumatoid arthritis (RA), systemic lupus erythematosus (SLE) or spondyloarthropathies (SpA), obliterative vasculopathy may rather be characteristic for systemic sclerosis (SSc) or mixed connective tissue disease (MCTD). Antiphospholipid antibodies have been implicated in vasculopathies underlying SLE, antiphospholipid syndrome (APS), RA and MCTD. There is also heterogeneity with respect to inflammatory risk factors. Cytokines, such as tumor necrosis factor-α (TNF-α) or interleukin 6 (IL-6) and immune complexes are primarily involved in arthritides, such as RA, SpA, as well as in SLE. On the other hand, autoantibodies including anti-oxLDL anti-cardiolipin and anti-β2GPI are rather involved in SLE- and APS-associated vasculopathies.
Regarding the non-invasive assessment of vascular function, endothelial dysfunction, overt atherosclerosis and vascular stiffness may be indicated by brachial artery flow-mediated vasodilation (FMD), common carotid intima-media thickness (ccIMT) and aortic pulse-wave velocity (PWV), respectively. These abnormalities have been described in most inflammatory rheumatic diseases. While ccIMT and stiffness are relatively stable, FMD may be influenced by many confounding factors. In addition to traditional vasculoprotection, immunosuppressive agents including corticosteroids, traditional and biologic DMARDs may have significant vascular and metabolic effects. The official EULAR recommendations on the assessment and management of cardiovascular disease in arthritides have just been published, and similar recommendations in connective tissue diseases are to be developed soon.

AUTOIMMUNITY REVIEWS 10:(7) pp. 416-425. (2011)

DECREASED FLOW-MEDIATED DILATATION WITH INCREASEDARTERIAL STIFFNESS AND THICKNESS AS EARLY SIGNS OF ATHEROSCLEROSIS IN POLYMYOSITIS AND DERMATOMYOSITIS PATIENTS

Melinda Vincze, Henrietta Dér, György Kerekes, Péter Szodoray, Margit Zeher, Katalin Dankó, Pál Soltész

Abstract Several autoimmune rheumatic diseases have been associated with accelerated atherosclerosis or other different types of vasculopathy depending on the underlying disease, leading to increased cardio- and cerebrovascular disease risk. Polymyositis (PM) and dermatomyositis (DM), members of idiopathic inflammatory myopathies (IIMs), a group of systemic autoimmune diseases are also associated with elevated
risk of cardiovascular diseases (CVD). Up until now, no specific data is known on the mechanisms, risk factors, or possible vasculopathy leading to increased CVD risk. The aims of the present study were to assess the flow-mediated dilatation of the brachial artery by a TensioClinic arteriograph and to measure the thickness of carotid artery intima–media, the augmentation index, and the pulse wave velocity using high-resolution ultrasonography in a cohort of PM and DM patients. We also investigated the correlation of these parameters with the traditional risk factors of atherosclerosis and overall cardiovascular status within PM and DM patients. Twenty-seven patients (21 females, six males) with IIMs were enrolled in this study, and 38 healthy individuals matched for sex and age served as controls. We found a decreased flowmediated dilatation in the brachial artery (6.36 vs. 8.39 %) with increased arterial stiffness and carotid artery thickness in our patients compared to healthy controls. We found significantly decreased flow-mediated dilatation of the brachial artery (5.57 vs. 8.39 %) in DM patients. We also detected a correlation between these parameters and the traditional cardiovascular risk factors, as well as hypertriglyceridemy, hypertension, and peripheral arterial disease. In DM, overall, more vascular abnormalities were found than in PM. Our findings suggest that flow-mediated dilatation of the brachial artery, arterial stiffness, and carotid artery thickness measurements could be beneficial for predicting the CVD risk in myositis patients. Further investigations need to find the potential differences and role of inflammation and immune mechanisms in atherosclerotic processes in DM and PM.

AUTOIMMUNITY REVIEWS 10:(7) pp. 416-425. (2011)

A COMPARATIVE STUDY OF ARTERIAL STIFFNESS, FLOW-MEDIATED VASODILATION OF THE BRACHIAL ARTERY, AND THE THICKNESS OF THE CAROTID ARTERY INTIMA–MEDIA IN PATIENTS WITH SYSTEMIC AUTOIMMUNE DISEASES

Pál Soltész, Henriett Dér, György Kerekes, Péter Szodoray, Gabriella Szücs Katalin Dankó, Yehuda Shoenfeld, Gyula Szegedi, Zoltán Szekanecz

Abstract Patients with autoimmune diseases may have increased vascular risk leading to higher mortality rates. Novel imaging techniques are necessary for the early assessment and management of these patients. In this study, we compared augmentation index (AIx) and pulse wave velocity (PWV), indicators of arterial stiffness, to brachial arterial flow-mediated vasodilation (FMD) and common carotid artery intima–media thickness (ccIMT), standard indicators of endothelial dysfunction and atherosclerosis, respectively. We wished to assess the vascular status of autoimmune patients by using a novel, cheap, and reproducible technique, the arteriograph. Altogether, 101 patients with systemic autoimmune diseases including primary antiphospholipid syndrome, systemic sclerosis, rheumatoid arthritis, and polymyositis, all having various types of vasculopathies, as well as 36 healthy individuals were investigated. Arterial stiffness was assessed by a TensioClinic arteriograph, a recently validated technique. Brachial arterial FMD and ccIMT were determined using high-resolution ultrasonography. Autoimmune patients exerted impaired FMD (3.7± 3.8%), increased ccIMT (0.7±0.2 mm), AIx (1.2±32.2%), and PWV (9.7±2.4 m/s) in comparison to control subjects (FMD=8.4±4.0%; ccIMT=0.6±0.1 mm; Aix=−41.1± 22.5%; PWV=8.0±1.5 m/s; $p<0.05$). We found a significant negative correlation of FMD with AIx ($R=-0.64$; $p<0.0001$) and PWV ($R=-0.37$; $p=0.00014$). There were significant positive correlations between ccIMT and AIx ($R=0.34$; $p= 0.0009$), ccIMT and PWV ($R=0.44$; $p<0.0001$), as well as AIx and PWV ($R=0.47$; $p<0.0001$). AIx, PWV, and ccIMT positively correlated and FMD negatively correlated with the age of the autoimmune patients. Arterial stiffness indicated by increased AIx and PWV may be strongly associated with endothelial dysfunction and overt atherosclerosis in patients with autoimmune diseases. Assessment of arterial stiffness, FMD, and ccIMT are reproducible and reliable noninvasive techniques for the complex assessment of vascular abnormalities in patients at high risk.

CLINICAL RHEUMATOLOGY 28:(6) pp. 655-662. (2009)

REDUCTION OF CORONARY FLOW RESERVE IN PATIENTS WITH INCREASED AORTIC STIFFNESS.

Attila Nemes, Tamás Forster, Miklós Csanády

Aortic stiffness is thought to affect coronary blood flow, but little is known about its influence on coronary flow reserve (CFR). The objective of the present study was to investigate the relationship between aortic stiffness and CFR in matched patients with and without increased aorticstiffness. Stress transoesophageal echocardiography (TEE) as the CFR measurement and coronary angiography were performed in all cases. Increased aortic stiffness was defined if elastic modulus Ep > 680 mmHg. The following patient populations free of coronary artery disease were compared: 36 subjects with normal aortic distensibility and 19 age-, sex-, and risk factor-matched patients with increased aorticstiffness. CFR was significantly reduced in patients with increased aortic stiffness as compared with cases with normal aortic distensibility(2.64 +/- 1.16 vs. 2.12 +/- 0.58, $p < 0.01$). Hyperaemic diastolic flow velocities were reduced in patients with increased aortic stiffness (129.5 +/- 36.6 cm/s vs. 102.1 +/- 39.8 cm/s, $p < 0.05$). Negative correlations were found between Ep and hyperaemic diastolic coronary flow velocity ($r = -0.41$, $p < 0.01$) and CFR ($r = -0.21$, $p < 0.05$). CFR is reduced in patients with increased aortic stiffness and negative correlations exist between these functional parameters.

Can J Physiol Pharmacol. 2007 Aug;85(8):818-22.

AORTIC VALVE REPLACEMENT FOR AORTIC STENOSIS IS ASSOCIATED WITH IMPROVED AORTIC DISTENSIBILITY AT LONG-TERM FOLLOW-UP.

Nemes A, Galema TW, Geleijnse ML, Soliman OI, Yap SC, Anwar AM, ten Cate FJ.

Background: Aortic valve stenosis (AS) is the most frequent form of valvular heart disease. The number of studies evaluating the effect of aortic valve replacement (AVR) for AS on aortic vascular function is limited. The aim of the present study was to examine alterations in aorticdistensibility in patients with AS during a 1-year follow-up after AVR.
Methods: Twelve patients with severe AS who underwent AVR were prospectively examined (mean age 65 +/- 11 years, 7 men). Systolic and diastolic ascending aortic diameters (SD and DD, respectively) were recorded in M mode 3 cm above the aortic valve from a parasternal long-axis view. The SD and DD were measured at the time of maximum anterior motion of the aorta and at the start of the QRS complex, respectively. Aortic stiffness index (beta) was defined as [ln(SBP/DBP)] x DD/deltaD, where ln is the natural logarithm, SBP and DBP are the systolic and diastolic blood pressure values, respectively, and deltaD = SD - DD.
Results: As expected, aortic stenosis severity and left ventricular mass decreased significantly after AVR. Aortic diameter changes (systolic minus diastolic dimensions) progressively increased and the aortic stiffness index progressively improved to levels comparable with those of age-, sex-, and risk factor-matched controls at the 1-year assessment.
Conclusions: Aortic valve replacement in patients with AS is associated with a progressive improvement in aortic distensibility to 1-year values similar to those of controls.

Am Heart J. 2007 Jan;153(1):147-51.

AORTIC STIFFNESS IS INCREASED IN ACROMEGALY - A TRANSTHORACIC ECHOCARDIOGRAPHIC STUDY.

Attila Nemes, Henriette Gavallér, Éva Csajbók, János Julesz, Tamás Forster, Miklós Csanády

Background: Acromegaly is associated with increased cardiovascular risk. Recent studies suggested a direct effect of growth hormone and insuline-like growth factor 1 excess on the vasculature over the conventional risk factors. The aim of the present study was to evaluate the stiffness of ascending aorta by means of transthoracic echocardiography (TTE) in patients with acromegaly.
Patients and methods: The following patient populations were compared: 20 subjects with negative coronary angiograms, 16 acromegalics and 21 patients with significant coronary artery disease (CAD). Aortic stiffness index (beta) was evaluated by means of TTE by use of the formula: beta=ln (SBP/DBP)/(DeltaD/DD), where SBP and DBP are the systolic and diastolic blood pressures, DD is the diastolic aortic diameter, DeltaD is the pulsatile change in aortic diameter (systolic diameter minus diastolic diameter) and 'ln' is the natural logarithm.
Results: The average time from diagnosis was 162+/-127 days in acromegalic patients. Transsphenoidal hypophysectomy was performed in 12 patients, while the mean growth hormone level was 10.8+/-11.7 mIU/ml. beta was similarly increased in acromegalics and in CAD patients as compared to controls (6.23+/-3.29 vs 16.47+/-14.53 and 16.66+/-15.49, $p<0.05$, respectively).
Conclusions: Stiffness of ascending aorta evaluated by a routine TTE examination is increased in acromegalics without overt cardiovascular disease as compared to controls and similar to CAD patients.

Int J Cardiol. 2008 Feb 20;124(1):121-3. Epub 2007 Mar 7.

OBESITY IS ASSOCIATED WITH AORTIC ENLARGEMENT AND INCREASED STIFFNESS: AN ECHOCARDIOGRAPHIC STUDY

Attila Nemes, Henriette Gavallér, Éva Csajbók, Tamás Forster, Miklós Csanády

Background: Obesity may be associated with early vascular changes. The current study was designed to assess the relationship between obesity and aortic stiffness in two populations, one aged 18-40 years and one aged 41-64 years.
Methods: The study complied 121 subjects, all of them underwent a physical examination, transthoracic echocardiography and blood pressure measurement. Aortic stiffness index (beta) was evaluated from aortic diameter and blood pressure data.
Results: Beta was higher in obese subjects both in the young (4.26 +/- 1.57 vs. 6.88 +/- 5.96, $P < 0.05$) and old patient populations (7.13 +/- 4.99 vs. 14.89 +/- 14.64, $P < 0.05$). Systolic (SD) aortic diameters (in mm) were enlarged in obese young patients (25.7 +/- 2.8 vs. 27.1 +/- 2.5, $P < 0.05$) and obese old subjects (28.0 +/- 3.0 vs. 30.3 +/- 3.3, $P < 0.05$). Diastolic (DD) aortic diameter (in mm) showed similar tendency in youngs (22.8 +/- 2.9 vs. 24.9 +/- 2.5, $P < 0.05$) and old subjects (25.9 +/- 2.7 vs. 28.0 +/- 3.1, $P < 0.05$).
Conclusions: Aortic stiffness is higher in young obese patients and similar to older subjects without obesity. Both SD and DD are increasing with age, but subjects within similar age group have larger SD and DD suggesting early vascular remodelling in obesity.

Int J Cardiovasc Imaging. 2008 Feb;24(2):165-71. Epub 2007 Aug 7.

PROGNOSTIC VALUE OF CORONARY FLOW RESERVE AND AORTIC DISTENSIBILITY INDICES IN PATIENTS WITH SUSPECTED CORONARY ARTERY DISEASE

Nemes A, Forster T, Geleijnse ML, Soliman OI, Ten Cate FJ, Csanády M.

In recent studies it has been demonstrated that a reduced coronary flow reserve (CFR) is independently associated with a less benign long-term outcome. Aortic stiffness is one of the most important cardiovascular risk factors predicting cardiovascular morbidity and mortality. Vasodilator stress transesophageal echocardiography (TEE) is a suitable method to evaluate simultaneously CFR and elastic properties of the descending thoracic aorta. The aim of the present study was to assess the relative prognostic value of simultaneously measured CFR and aortic elastic properties by pulsed-wave Doppler TEE in patients with suspected or known coronary artery disease (CAD). The study comprised 157 in-hospital patients with chest pain. In all patients, stress TEE was used for the simultaneous evaluation of CFR and aorticdistensibility indices [elastic modulus E(p) and Young's circumferential static elastic modulus E(s)]. During a mean follow-up of 48 +/- 8 months, 13 patients suffered cardiovascular death. By univariate analysis older age, diabetes mellitus, increased left ventricular (LV) end-diastolic diameter, increased LV mass index, lower LV ejection fraction, and lower CFR were significant predictors of cardiovascular survival. Multivariate regression analysis showed that only CFR (hazard ratio [HR] 10.31, P = 0.04), age (HR 1.20, P = 0.001), and increased left ventricular (LV) end-diastolic diameter (HR 1.14, P = 0.02) were independent predictors of cardiovascular survival. Only in the small number of patients without CAD and abnormal CFR aortic distensibility seemed to provide complementary prognostic information over CFR. In the majority of patients aortic distensibility did not offer complementary prognostic information to CFR during vasodilator stress TEE testing.

Heart Vessels. 2008 May;23(3):167-73. doi: 10.1007/s00380-007-1026-5. Epub 2008 May 17.

CORRELATIONS BETWEEN AORTIC STIFFNESS AND PARASYMPATHETIC AUTONOMIC FUNCTION IN HEALTHY VOLUNTEERS

Attila Nemes, Róbert Takács, Henriette Gavallér, Tamás Várkonyi, Tibor Wittmann, Tamás Forster, Csaba Lengyel

Cardiovascular autonomic dysfunction and alterations in vascular elasticity are known complications of several disorders, including diabetes mellitus, hypertension, hypercholesterolemia, aging, and chronic kidney disease. The current study was designed to test whether a relationship existed between pulse wave velocity (PWV), augmentation index (AIx), aortic elastic properties, and cardiovascular autonomic function in healthy volunteers. The study comprised 25 healthy volunteers, whose aortic strain, distensibility, and stiffness index were measured by echocardiography, whereas PWV and AIx were evaluated by Arteriograph (TensioMed, Budapest, Hungary) in all cases. Autonomic function was assessed by means of 5 standard cardiovascular reflex tests. We found that heart rate response to deep breathing, as the most reproducible cardiovascular reflex test to characterize parasympathetic function, showed low to moderate correlations with PWV ($r = -0.431$, $p = 0.032$), aortic strain ($r = 0.594$, $p = 0.002$), distensibility ($r = 0.407$, $p = 0.043$), and stiffness index ($r = -0.453$, $p = 0.023$). Valsalva ratio and autonomic neuropathy score (ANS) correlated with PWV ($r = -0.557$, $p = 0.004$ and $r = -0.421$, $p = 0.036$, respectively) and AIx ($r = -0.461$, $p = 0.020$ and $r = -0.385$, $p = 0.057$, respectively), while ANS correlated with even aortic stiffness index ($r = -0.457$, $p = 0.022$). Cardiovascular reflex tests mainly characterizing sympathetic function had no correlation with aortic stiffness parameters (p = NS for all correlations). Correlations exist between parameters characterizing aortic elasticity and parasympathetic autonomic function, as shown by standard cardiovascular reflex tests in healthy volunteers.

Can J Physiol Pharmacol. 2010 Dec;88(12):1166-71. doi: 10.1139/Y10-095.

CORRELATIONS BETWEEN ARTERIOGRAPH-DERIVED PULSE WAVE VELOCITY AND AORTIC ELASTIC PROPERTIES BY ECHOCARDIOGRAPHY

Attila Nemes, Róbert Takács, Henriette Gavallér, Tamás Várkonyi, Tibor Wittmann, Tamás Forster, Csaba Lengyel

Introduction: There is an increased scientific interest on the evaluation of parameters characterizing aortic elasticity. The current study was designed to compare two characteristics of aortic distensibility: Arteriograph-derived pulse wave velocity (PWV) and augmentation index standardized to 80 per minutes heart rate (AIx80) and aortic elastic properties by echocardiography.
Methods: The study comprised 21 adult healthy volunteers. In all cases, systolic and diastolic ascending aortic diameters were recorded during transthoracic echocardiography in M-mode at a level 3 cm above the aortic valve from a parasternal long-axis view. Using forearm blood pressure values, the following aortic elastic properties were calculated: aortic strain, distensibility and stiffness index. All patients were examined by Arteriograph at the same time, as well.
Results: The Arteriograph-derived AIx80 and PWV correlated with aortic strain (R = -0·495, P = 0·023 and R = -0·527, P = 0·014, respectively) and aortic stiffness index (R = 0·454, P = 0·039 and R = 0·608, P = 0·003, respectively). Aortic distensibility did not correlated with AIx80 (R = -0·344, P = 0·127), only with PWV (R = -0·593, P = 0·005, respectively).
Discussion: Low to moderate correlations could be demonstrated between Arteriograph-derived PWV and aortic elastic properties by echocardiography.

Clin Physiol Funct Imaging. 2011 Jan;31(1):61-5. doi: 10.1111/j.1475-097X.2010.00980.x. Epub 2010 Oct 12.

HYPERTROPHIC CARDIOMYOPATHY IS ASSOCIATED WITH ABNORMAL ECHOCARDIOGRAPHIC AORTIC ELASTIC PROPERTIES AND ARTERIOGRAPH-DERIVED PULSE-WAVE VELOCITY

Henriette Gavallér, Róbert Sepp, Miklós Csanády, Tamás Forster, Attila Nemes

Objective: Hypertrophic cardiomyopathy (HCM) is a genetic cardiac disease and defined by the presence of unexplained left ventricular hypertrophy (LVH). Vascular alterations are frequently associated with HCM including microvascular and/or peripherial endothelial dysfunction. This study was designed to evaluate echocardiographic ascending aortic elastic properties and arteriograph-derived pulse-wave velocity (PWV) and augmentation index (Aix) in HCM.

Methods: This study comprised 38 patients with typical features of HCM. Their results were compared to 20 hypertensive patients with LVH and 23 controls. Systolic and diastolic ascending aortic diameters were recorded in M-mode at a level of 3 cm above the aortic valve from a parasternal long-axis view. The following echocardiographic aortic elastic properties were measured from aortic data and forearm blood pressure values: aortic strain, distensibility, and stiffness index. Arteriograph-derived PWV and AIx were also measured.

Results: Aortic stiffness index (18.4 ± 17.6 vs. 6.88 ± 3.63, $P < 0.05$), PWV (9.44 ± 4.08 vs. 7.97 ± 1.20 m/sec, $P < 0.05$) and Aix (-24.9 ± 32.6 vs. -41.4 ± 24.3, $P < 0.05$) were increased, while aortic strain (0.061 ± 0.053 vs. 0.100 ± 0.059, $P < 0.05$) and aortic distensibility (1.94 ± 1.68 cm(2) /dynes 10(-6) vs. 3.08 ± 1.77 cm(2) /dynes 10(-6) , $P < 0.05$) were decreased in HCM patients compared to controls. Aortic elastic properties of hypertensive patients with LVH showed similar alterations to HCM patients.

Conclusions: Abnormal echocardiographic aortic elastic properties and arteriograph-derived PWV and Aix could be demonstrated in HCM patients compared to matched controls.

Echocardiography. 2011 Sep;28(8):848-52. doi: 10.1111/j.1540-8175.2011.01469.x. Epub 2011 Aug 9.

CORRELATIONS BETWEEN ECHOCARDIOGRAPHIC AORTIC ELASTIC PROPERTIES AND LEFT VENTRICULAR ROTATION AND TWIST--INSIGHTS FROM THE THREE-DIMENSIONAL SPECKLE-TRACKING ECHOCARDIOGRAPHIC MAGYAR-HEALTHY STUDY

Attila Nemes, Anita Kalapos, Péter Domsik, Csaba Lengyel, Orosz Andrea, Tamás Forster

Introduction: There is an interaction between the left ventricle (LV) and the vascular system, which plays a crucial role in determining cardiac output. LV twist could be evaluated by three-dimensional speckle-tracking echocardiography (3DSTE) as the net difference of counterclockwise apical and clockwise basal LV rotations during systole. Aortic elasticity parameters could be measured during a routine transthoracic echocardiographic examination. The current study was designed to evaluate correlations between echocardiographic aorticelastic properties and LV rotational mechanics in healthy subjects.
Methods: The present study comprised 26 healthy volunteers (mean age: 34.5 ± 9.8 years, 13 men). The following aortic elastic properties were measured from aortic data and forearm blood pressure values: aortic strain, distensibility and stiffness index (ASI). 3DSTE was used to measure basal and apical LV rotations and LV twist.
Results: During 3DSTE, basal LV rotation proved to be -2.42 ± 1.43 degree, while apical LV rotation was 8.56 ± 1.43 degree, therefore LV twist was 11.01 ± 5.19 degree. Aortic strain (0.131 ± 0.094), distensibility (3.61 ± 2.54 cm^2 dynes(-1) 10(-6)) and ASI (4.08 ± 0.79) were also calculated. Apical LV rotation correlated with aortic distensibility ($r = -0.36$, $P<0.05$) and ASI ($r = 0.41$, $P<0.05$). LV twist showed similar correlation with ASI ($r = 0.42$, $P<0.05$).
Discussion: Correlations exist between echocardiographic aortic elastic properties and 3DSTE-derived LV rotation and twist in healthy subjects.

Clin Physiol Funct Imaging. 2013 Sep;33(5):381-5. doi: 10.1111/cpf.12039. Epub 2013 Apr 15.

IS THERE A RELATIONSHIP BETWEEN INCREASED AORTIC STIFFNESS AND SEGMENTAL LEFT VENTRICULAR DEFORMATION IN ELITE ATHLETES? (INSIGHTS FROM THE MAGYAR-SPORT STUDY).

Attila Nemes, Anita Kalapos, Péter Domsik, Mónika Oszlánczi, Csaba Lengyel, Balogh L, Tamás Forster

Introduction: Myocardial contractility of the left ventricle (LV) is related to arterial distensibility. Sport activity is frequently associated with changes in both LV and arterial functions. This study aimed to find correlations between three-dimensional speckle-tracking echocardiography-derived segmental LV deformation parameters and echocardiographically assessed aortic stiffness index (ASI) in athletes. This study comprised 26 young elite athletes (mean age: 26.7 ± 8.4 years, nine men).
Results: Among segmental circumferential strains (CSs), only that of apical anterior ($r = 0.40$, $p = 0.05$), septal ($r = 0.47$, $p = 0.01$), inferior ($r = 0.59$, $p = 0.001$), lateral ($r = 0.44$, $p < 0.05$), and midventricular anteroseptal ($r = 0.44$, $p < 0.05$) segments correlated with ASI, whereas LV-CS of the midventricular anterior segment showed a correlation tendency. Only longitudinal strain of basal anteroseptal ($r = -0.46$, $p < 0.05$) and inferoseptal ($r = -0.57$, $p < 0.01$) segments showed correlations with ASI, whereas that of the basal anterior segment had only a tendency to correlate. Some segmental multidirectional strains also correlated with ASI.
Conclusions: Correlations could be demonstrated between increased aortic stiffness and circular function of the apical and midventricular LV fibers and longitudinal motion of the basal septum and LV anterior wall (part of LV outflow tract) in maintaining circulation in the elite athletes.

Physiol Int. 2017 Jun 1;104(2):206-215. doi: 10.1556/2060.104.2017.2.3. Epub 2017 Jun 26.

ÁLTALÁNOS INFORMÁCIÓK

HELYSZÍN, IDŐPONT:
*Hotel NOVOTEL BUDAPEST DANUBE**** (1027 Budapest, Bem rakpart 33-34.)*
2018. május 04., péntek - 10:00 óra

A KONFERENCIA HONLAPJA: http://www.stand-art.hu/MAST2018

JELENTKEZÉS MÓDJAI

- Online jelentkezés a konferencia honlapján keresztül
- Levélben, e-mailen (anita@stand-art.hu) vagy faxon (+36/62-661-331) a jelentkezési lap kitöltésével és a kongresszusi irodának történő eljuttatásával

SZÁLLÁSINFORMÁCIÓ
A szállodáról információ a kongresszus honlapján található: www.stand-art.hu/MAST2018 . A szállásfoglalás a rendezvényre egyénileg történik.

SZERVEZŐIRODA, ÁLTALÁNOS INFORMÁCIÓ
Stand-Art Event Management
6723 Szeged, Tisza Palota B/2., Felső Tisza-part 31-34.
Tel: +36/62-999-950; Fax: +36/62-661-331
E-mail: info@stand-art.hu

REGISZTRÁCIÓ
Stand-Art Event Management
Garhuth Anita project manager
Tel.: +36/62-999-950; Fax: +36/62-661-331; Mobil: +36/30-619-7348
E-mail: anita@stand-art.hu

KONGRESSZUSI IRODA, REGISZTRÁCIÓ
2018. május 4-én: 09.00 – 13.00 h

KONGRESSZUSI IRODA TELEFONSZÁMA
2018. május 4-én: +36/30-619-7348

PARKOLÁS
A konferencia helyszínén parkolási díjat kell fizetni, információk:
http://www.masodikkerulet.hu/varosrendeszet/menu/parkolas

Nebilet®

az originális nebivolol[1]

Az anyagcsere semleges ß-blokkoló[2]



- 6 hónapos nebivolol kezelés mellett nem változnak érdemben a vércukor és lipid paraméterek[2]

Nebilet® 5 mg tabletta
Rövidített alkalmazási előírás
Hatóanyag: 5,00 mg nebivolol tablettánként. **Javallatok:** Esszenciális hipertónia kezelése. Stabil, enyhe illetve középsúlyos krónikus szívelégtelenség kezelése a standard terápia kiegészítéseként idős korú (70 éves és idősebb) betegeknél. **Adagolás:** Hipertónia: *Felnőttek:* Az adag naponta egy tabletta (5 mg). *Időskor:* 65 év feletti betegek esetében az ajánlott kezdő dózis 2,5 mg/nap. Ha szükséges, a napi dózis 5 mg-ig emelhető. Krónikus szívelégtelenség: A Nebilet kezelést az adag 1-2 hetenként történő lépésenkénti emelésével a következő sémát alkalmazva javasolt elkezdeni: A kezdő adag 1,25 mg nebivolol naponta, amely növelhető 2,5 mg/nap adagra, utána 5 mg/nap adagra, majd végül 10 mg/nap adagig. A maximális ajánlott adag 10 mg nebivolol, naponta egyszer. **Ellenjavallatok:** A hatóanyaggal, illetve a tabletta segédanyagaival szembeni túlérzékenység. Májelégtelenség, vagy májfunkció-károsodás. Terhesség és szoptatás időszaka. Akut szívelégtelenség, kardiogén sokk, illetve intravénás inotrop terápiára szoruló dekompenzált szívelégtelenség epizódok. Ezen kívül, úgy, mint egyéb béta-blokkolók esetében, a Nebilet adása kontraindikált: sick sinus szindróma, beleértve a sinoatrialis blokkokat, másod- és harmadfokú atrioventricularis blokk (pacemaker nélkül), bronchospazmus, illetve asthma bronchiale az anamnézisben, kezeletlen phaeochromocytoma, metabolikus acidózis, bradycardia (szívfrekvencia < 60/perc), hipotónia (a szisztolés vérnyomás 90 Hgmm alatti), súlyos perifériás keringési zavar. **Leggyakoribb mellékhatások (>0,1%):** Fejfájás, szédülés, paraesthesiák, dyspnoe, székrekedés, émelygés, hasmenés, fáradtság, ödéma, rémálmok, depresszió, látás romlása, bradycardia, szívelégtelenség (súlyosbodása), lassult AV-vezetés / AV blokk, hipotónia, claudicatio intermittens súlyosbodása, bronchospazmus, dyspepsia, flatulentia, hányás, viszketés, erythemás bőrkiütés, impotencia. **Kiadhatóság:** Kizárólag orvosi rendelvényhez kötött gyógyszer. Bővebb információért olvassa el a gyógyszer alkalmazási előírását! OGYI-T- 6982/03. Alkalmazási előírás dátuma: 2015.10.09. **Térítési díj:** Nebilet 5 mg tabletta 28x: 968 Ft (közfinanszírozás alapjául elfogadott ár: 1377 Ft, a normatív támogatás összege: 409 Ft). Az esetleges árváltozásról kérjük tájékozódjon a www.oep.hu weboldalon. A dokumentum lezárásának időpontja: 2017.10.10. Dokumentum érvényessége: 2019.10.10.

Hivatkozás: 1. IMS Health Generic Sales Dataview adatbázis, 2016. május **2.** Celik T. et al. Comparative effects of nebivolol and metoprolol on oxidative stress, insulin resistance, plasma adiponectin and soluble P-selectin levels in hypertensive patients. J Hypertens 2006;24:591-596.

NEB2017#11547#

BERLIN-CHEMIE MENARINI

Innovációval az életminőség javításáért.

Berlin-Chemie/A. Menarini Kft.
2040 Budaörs, Neumann J. u. 1.
Tel.: 23/501-301

A RENDEZVÉNY TÁMOGATÓI

Berlin-Chemie/A. Menarini

Jakab és Tsi Kft.

Premium Health Concepts Kft.

Servier Hungária Kft.

