Rana ateroskleroza i parametri arterijske popustljivosti kod djece s čimbenicima kardiovaskularnog rizika

Early atherosclerosis and arterial compliance in children with cardiovascular risk factors

Krešimir Putarek*,
Ljiljana Banfić,
Marijan Pašalić,
Anita Špehar Uroić,
Nataša Rojnić Putarek

Medicinski fakultet Sveučilišta
u Zagrebu, Klinički bolnički
centar Zagreb, Zagreb,
Hrvatska

University of Zagreb School of
Medicine, University Hospital
Centre Zagreb, Zagreb, Croatia

KLJUČNE RIJEČI: preateroskleroza, arterijska krutost, arterijska popustljivost, pretilost, šećerna bolest.

KEYWORDS: preatherosclerosis, arterial stiffness, arterial compliance, diabetes mellitus, obesity.

CITATION: Cardiol Croat. 2016;11(10-11):501. | DOI: <http://dx.doi.org/10.15836/ccar2016.501>

***ADDRESS FOR CORRESPONDENCE:** Krešimir Putarek, Klinički bolnički centar Zagreb, Kišpatičeva 12, HR-10000 Zagreb, Croatia. / Phone: +385-91-3015-574 / E-mail: kputarek@hotmail.com

ORCID: Krešimir Putarek, <http://orcid.org/0000-0003-0361-5740> • Ljiljana Banfić, <http://orcid.org/0000-0002-4538-8980>
Marijan Pašalić, <http://orcid.org/0000-0002-3197-2190> • Anita Špehar Uroić, <http://orcid.org/0000-0002-5663-8316>
Nataša Rojnić Putarek, <http://orcid.org/0000-0002-6057-6373>

Uvod: Promjene na krvnim žilama u sklopu ateroskleroze mogu dugo ostati nezamijećene, a manifestacije bolesti su evidentne relativno kasno.^{1,3}

Pacijenti i metode: Kako bi odredili parametre arterijske krutosti kod bolesnika s prekliničkom aterosklerozom, u suradnji sa Zavodom za endokrinologiju Klinike za pedijatriju, analizirali smo ukupno 148 djece, od toga 68 pretilih, 42 sa šećernom bolesti tipa 1 trajanja preko 5 godina te 38 kontrolnih ispitanika. Ispitanici nisu imali kliničkih manifestacija aterosklerotske bolesti, a odabrani su zbog poznatog utjecaja šećerne bolesti i pretilosti na razvoj ateroskleroze. Ispitanicima je učinjena „e-tracking“ analiza (beta indeks, arterijska popustljivost-AC, brzina pulsno vala-PWV, augmentacijski indeks-AI) te mjerenje debljine intima-medije (IMT) karotidne arterije. Metoda određivanja arterijske krutosti koristi visokorezolucijski ultrazvuk s dodatkom radiofrekventnog područja te je u mogućnosti putem praćenja gibanja stijenke arterije prikupiti podatke o deformaciji stijenke arterije ovisno o pulsnom valu. Zajednička karotidna arterija se analizira na mjestu 1-2 cm udaljenom od bifurkacije u unutarnju i vanjsku karotidnu arteriju. Važno je imati adekvatan prikaz intime i medije. Nakon adekvatnog prikaza karotidne arterije u najduljem dijametri postavlja se marker koji prati arterijsku stijenku („tracking gate“) na granicu medije i intime anteriorne i posteriorne stijenke. Uređaj precizno prati pomake i deformacije arterijske stijenke tijekom srčanog ciklusa.

Rezultati: Značajne razlike između sve tri skupine zamijećene su u vrijednosti AC ($p=0.004$) te IMT ($p=0.022$). U usporedbi skupina značajna je razlika između skupine bolesnika s šećernom bolesti i kontrole za IMT ($p=0.015$) te između pretilih i bolesnika sa šećernom bolesti za vrijednosti IMT ($p=0.002$) i AC ($p=0.004$).

Zaključak: Arterijska popustljivost kod ovih je ispitanika najosjetljiviji parametar rane asimptomatske ateroskleroze mjerene „e-trackingom“. Također, morfološki pokazatelj, IMT, može imati ulogu u ranoj detekciji bolesti, osobito u kombinaciji s funkcijskim pokazateljima. Prema dobivenim podacima, šećerna bolest tipa 2 trajanja preko 5 godina značajniji je čimbenik rizika za razvoj rane ateroskleroze od pretilosti.

Introduction: Early atherosclerosis is asymptomatic, and clinical manifestations are visible relatively late.^{1,3}

Patients and Methods: To determine parameters of arterial stiffness in pediatric patients with preatherosclerosis, in cooperation with Department of Pediatric Endocrinology, we have analyzed 148 patients, 68 obese, 42 with diabetes mellitus type 1 with duration over 5 years, and 38 controls. Patients did not have clinical manifestations of atherosclerosis. The groups were formed due to well-known influence of diabetes and obesity as a risk factors for cardiovascular disease. In our study pediatric patients with diabetes mellitus type 1, obese patients and controls were screened with e-tracking ultrasound method. Novel methods for determination of arterial stiffness by ultrasound e-tracking analysis is easy, safe and reproducible allowing measurement of parameters like Beta stiffness index, pulse wave velocity (PWV), augmentation index (AI), arterial compliance (AC) and elasticity modulus (Ep). Common carotid artery is analyzed 1-2 cm from bifurcation on anterior and posterior wall of vessel. Accurate image of intima-media border is essential for analysis. By positioning the tracking gate on arterial wall we can measure deformation of artery during cardiac cycle.

Results: We found significant difference in AC ($p=0.004$) and intima media thickness ($p=0.022$) between all groups. Also, significant difference between group was found in IMT (diabetic patients vs. control, $p=0.015$), in IMT (diabetic vs. control, $p=0.002$) and in AC (diabetic patients vs. obese patients, $p=0.004$).

Conclusion: Arterial compliance is most sensitive parameter of early atherosclerosis. Intima-media thickness could be additional marker in detection of preatherosclerosis. Combination of functional arterial stiffness parameters with early morphological markers like IMT is useful in diagnosis and follow-up of these patients. According to our data diabetes mellitus is more significant risk factor than obesity in pediatric patients.

RECEIVED:
September 23, 2016

ACCEPTED:
October 10, 2016

LITERATURE

- Lorenz MW, Markus HS, Bots ML, Rosvall M, Sitzer M. Prediction of clinical cardiovascular events with carotid intima-media thickness: a systematic review and meta-analysis. *Circulation*. 2007;115(4):459-67. DOI: <http://dx.doi.org/10.1161/CIRCULATIONAHA.106.628875>
- Van Bortel LM, Duprez D, Starmans-Kool MJ, Safar ME, Giannattasio C, Cockcroft J, et al. Clinical applications of arterial stiffness, Task Force III: recommendations for user procedures. *Am J Hypertens*. 2002 May;15(5):445-52. DOI: [http://dx.doi.org/10.1016/S0895-7061\(01\)02326-3](http://dx.doi.org/10.1016/S0895-7061(01)02326-3)
- Lee E, Emoto M, Teramura M, Tsuchikura S, Ueno H, Shinohara K, et al. The combination of IMT and stiffness parameter beta is highly associated with concurrent coronary artery disease in type 2 diabetes. *J Atheroscler Thromb*. 2009 Mar;16(1):33-9. DOI: <http://dx.doi.org/10.5551/jat.E605>