Ehokardiografija u plućnoj emboliji

Echocardiography in pulmonary embolism

Nikola Bulj

Klinička bolnica Sestre milosrdnice, Zagreb, Hrvatska
Clinical Hospital Sestre milosrdnice, Zagreb, Croatia

Sažetak

Plućna tromboembolija je naglo nastala opstrukcija plućnog krvotoka ugruškom krvi. Prema najvećoj do sada provedenoj studiji u Sjedinjenim Američkim Državama u razdoblju između 1979. do 1998. godine, incidencija u općoj populaciji iznosila je oko 1,5% odnosno s oko pretpostavljenih 600.000 slučajeva godišnje. Stvarni broj bolesnika vjerojatno je i veći uzimajući u obzir pretpostavku da barem polovica bolesnika ostane neprepoznata uslijed velike kliničke varijabilnosti bolesti. Plućna embolija predstavlja hitno stanje visoke smrtnosti koja u neliječenih bolesnika doseže i do 30%, najčešće zbog ponovljene tromboembolije nekoliko sati od početnog događaja.

Osnovni patofiziološki mehanizam plućne tromboembolije je povećanje otpora u plućnoj cirkulaciji uslijed začepljenja krvnim ugrušcima s posljedičnim akutnim tlačnim opterećenjem desnog srca koje može uzrokovati njegovo popuštanje. Višestruka klinička ispitivanja uvjerljivo su dokazala da disfunkcija desne klijetke (DV) hipotenzivnih i normotenzivnih bolesnika sa plućnom embolijom izravno utječe na ranu odnosno intrahospitalnu smrtnost. Akutni porast otpora u plućnoj cirkulaciji izravno se odražava na funkciju DV koji se u opterećenju dilatira dok su kontrakcije slobodne stjenke oslabljene. Važno je istaknuti da je prilagodbeni mehanizam na akutno tlačno opterećenje ograničen i da DV udarni, odnosno minutni, volumen može ostvarivati pri tlakovima u plućnoj cirkulaciji do maksimalno oko 50 mmHg. Istraživanja pokazuju da ehokardiografija ima visoku dijagnostičku i prognostičku vrijednost u bolesnika s plućnom embolijom obzirom da oko 50% bolesnika ima neku od ehokardiografskih promjena desnog srca. Ipak, treba imati na umu da je senzitivnost metode u normotenzivnih bolesnika oko 60%, dakle negativni rezultat ne može isključiti oboljenje. Kod hemodinamski ugroženih bolesnika, situacija je sasvim drugačija. Naime, kod ovih bolesnika negativan nalaz ehokardiograma praktički isključuje dijagnozu plućne embolije. Štoviše, ehokardiografija u tom slučaju može pružiti dodatne informacije o drugim mogućim uzrocima hemodinamske nestabilnosti kao što su tamponada, hipovolemija, ishemija miokarda, akutna valvularna bolest i sl.

Okvirno, ehokardiografske pokazatelja akutnog tlačnog opterećenja možemo podijeliti u dvije skupine: one dobivene slikovnim prikazom desnog srca (2-D i M-mode) i one dobivene doplerskim mjerenjima. U prvu skupinu spada: izravni prikaz tromba u stablu ili ograncima plućne arterije, dilatacija plućne arterije, uvećanje DV i desnog atrija, smanjena veličina lijevog ventrikula, paradoksalni pomaci interventrikularnog septuma, poremećaji kinetike stjenki DV (McConnellov znak), distenzija donje šuplje vene uz gubitak respiratornih varijacija. U drugu skupinu spadaju doplerom dobiveni podaci, u prvom redu brzina mlaza trikuspidne regurgitacije i skraćeno vrijeme pulmo-

Abstract

Pulmonary thromboembolism is a suddenly occurred obstruction of the pulmonary blood circulation by a thrombus. According to the most extensive study conducted so far in the United States of America during the period from 1979 to 1998, the incidence in general population amounted to around 1.5% that is, as assumed 600,000 cases per year. The actual number of patients is probably greater considering the assumption that at least one half of patients remain unrecognized due to a great disease clinical variability. The pulmonary embolism represents emergency with high mortality rate (in non-treated patients amounts up to 30%), usually due to recurring thromoembolism a few hours following the initial event.

The basic pathophysiological mechanism of pulmonary thromboembolism is an increase in resistance in the pulmonary circulation due to clogging by thrombi with consequential acute pressure stress of the right heart that may cause its failure. Multiple clinical tests have convincingly proved that the dysfunction of the right ventricle of hypotensive and normotensive patients with pulmonary embolism directly impact an early or intrahospital death. An acute increase in resistance in pulmonary circulation is directly reflected on the function of the right ventricle that is dilatated in stress, while the contractions of the free wall are weakened. It is important to mention that the adjustment mechanism to acute pressure load is limited and that the right ventricle and stroke volume, that is, minute volume may be achieve in case of pressures in pulmonary circulation up to 50 mmHg. Researches show that echocardiography has a high diagnostic and prognostic value in patients with pulmonary embolism since around 50% of patients have some of the echocardiographic right heart deformation. Anyway, we should bear in mind that the sensitivity of the method in normotensive patients is around 60%, so a negative result may not exclude the disease. In case of hemodynamically endangered patients, the situation is completely different. Namely, a negative finding of echocardiography practically excludes the pulmonary embolism diagnosis in such patients. Moreover, echocardiography in such a case may provide additional information on some other possible causes of hemodynamic instability, such as tamponade, hypovolemia, myocardial ischemia, acute valvular disease etc.

Generally, echocardiographic indicators of acute pressure load may be divided in two groups: those obtained by image of the right heart (2-D and M-mode) and those obtained by Doppler measurements. The first group includes: a direct image of the thrombus in the pulmonary arterial tree and branches, dilatation of the pulmonary artery, enlargement of the right ventricle and atrium, reduced size of the left ventricle, paradoxal shifts of interventricular septum, disorders of the right ventricle wall kinetics (McCon-

nalne akceleracije protoka (PV AT). Pokazalo se da upravo kombinacija doplerski dobivenih mjerenja (takozvani "60/60" znak — PV AT <60 msec i tlak u plućnoj arteriji manji od 60 mm Hg), pogotovo ako su udružena sa poremećajima kontraktiliteta DV (McConnellov znak) imaju najveću pozitivnu prediktivnu vrijednost u ehokardiografskoj dijagnozi plućne embolije, čak i u onih bolesnika s od ranije poznatom drugom kardiovaskularnom bolesti.

Uzimajući sve navedeno u obzir, Europsko kardiološko društvo u svojim smjernicama za dijagnostiku i liječenje bolesnika s plućnom embolijom preporuča ehokardiografiju kao dijagnostičku metodu izbora kod hemodinamski ugroženih bolesnika kod kojih nije moguće učiniti hitnu CT angiografiju plućne arterije. Uloga ehokardiografije u hemodinamski neugroženih bolesnika u prvom je redu rezervirana za dodatnu procjenu rizika ranog mortaliteta, odnosno svrstavanje bolesnika u skupine srednjeg ili niskog rizika.

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E-mail: nbulj@kbsm.hr

nel sign), distension of the inferior vena cava followed by a loss of respiratory variations. The second group includes the data obtained by Doppler, primarily the velocity of the tricuspid regurgitation flow and reduced time of pulmonary flow acceleration (PV AT). It was shown that the combination of the measurements obtained by Doppler (so called "60/60" sign — PV AT <60 msec and the pressure in the pulmonary artery is below 60 mm Hg), especially if they accompany disorders of the right ventricular contractility (McConnellov sign) have the largest positive predictive value in the echocardiographic diagnosis of the pulmonary embolism, even in those patients with previously known cardiovascular disease.

Taking all the above-mentioned into consideration, the European Society of Cardiology in its guidelines for diagnostics and treatment of patients with pulmonary embolism suggests echocardiography as a diagnostic method of choice in hemodynamically endangered patients for whom it is not possible to perform urgent CT pulmonary artery angiography. The role of echocardiography in hemodynamically not endangered patients is primarily reserved for additional evaluation of the early risk mortality, that is, classification of patients into medium or low risk groups.