vrstu testa. Rutinski su većinom korišteni SET s opterećenjem vježbom i SET s dobutaminom, a manje dipiridamol SET i samo kod nekih pacijenata SET s primjenom elektrostimulatora.

Slaba točka SET je visoka ovisnost o ljudskom faktoru, tj. potrebno je biti stručnjak. Uporaba ehokardiografskih kontrastnih sredstava može poboljšati vizualizaciju endokardijalnih granica i učiniti SET pouzdanijim i izvedivim kod pacijenata sa slabim akustičkim prozorom, no ipak je ovisna o njihovoj relativno visokoj cijeni. Kod odabranih pacijenata, upotreba 3-D, strain i strain rate slikovne dijagnostike može biti korisna, no u većini centara nije dio rutinskih postupaka. Razlog zašto SET u mnogim kardiološkim odjelima nije obavljan rutinski (ili uopće!) je činjenica da su potrebne dodatne investicije, iako su te investicije mnogo manje od onih potrebnih za druge metode, kao što je nuklearna medicina ili višeslojni CT. Ako se poduzmu dostatne investicije u obuku, opremu, vrijeme i način razmišljanja, SET postaje integrativni dio rutinske kardiološke procjene i procesa donošenja odluka, te se kod većine pacijenata može u potpunosti izbjeći korištenje scintigrafije miokarda (ili višeslojnog CT), također izbjegavajući i njihove nuspojave (zračenje) i rezervirati primjenu tih metoda samo za slučajeve kada se SET ne može obaviti, kada su rezultati SET-a nedostatni ili ukazuju na potrebu za dodatnom procjenom ili invazivnim liječenjem.

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containdications for the type of test. Mostly exercise SET and dobutamine SET have been routinely used, less dipyridamole SET and only in some pts. pacing SET.

One of the weak points of stress echo is its high dependence on the human factor, i.e. one needs to be an expert. Use of echocardiographic contrast agents can improve the visualization of endocardial borders and make the SET more reliable and feasible also in patients with poor acoustic window, but it is still correlated with relative high costs of the contrast agent. In selected pts, use of 3-D, strain and strain rate imaging can be useful, but it is not part of the routine in most of centers. The reason why SET has not been performed routinely (or not at all!) in many cardiological departments is the fact that additional investment is needed, although this investment is much inferior then those needed for other methods, like nuclear medicine or multislice CT. If sufficient investment in training, equipment, time and way of thinking is done, SET becomes integrative part of the routine cardiological evaluation and decision making process and it can in most pts completely avoid use of myocardial scintigraphy (or multislice CT), avoiding also their side-effects (radiation) and preserving the application of these methods only when SET cannot be performed, when results of SET are insufficient or indicate the need for further evaluation or invasive treatment.

Ehokardiografska enigma miokarditisa

Myocarditis — the echocardiography enigma

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Sažetak

Obratite pažnju na knjige o ehokardiografiji. U pravilu u njima ne nalazite tekstove niti slikovne zapise posvećene miokarditisu. Ehokardiografske manifestacije miokarditisa su brojne i nažalost nespecifične. Postavlja se ipak pitanje kada će nam transtorakalna ehokardiografija biti presudna u postavljanju dijagnoze?

Dijagnozu miokarditisa je teško postaviti. Akutni miokarditis se klinički može manifestirati s brojnim simptomima koji nerijetko sugeriraju infektivno zbivanje uz bol u prsištu, a fizikalnim pregledom registriramo ubrzanu srčanu akciju, nepravilnosti rada srca, znakove popuštanja srca kao crpke sve do srećom rijetko, kardiogenog šoka. Elektrokardiografski pored tahikardije možemo naći atrijske i ventrikularne poremećaje ritma, smetnje A-V kondukcije, te promjene ST-segmenta u okviru pridruženog perikarditisa. Bolesnici u rutinskoj laboratorijskoj dijagnostici imaju povišene upalne parametre uz više ili manje izražen porast biljega srčane nekroze. Sjena srca radiološki može biti uredne veličine. U 1% do 9% rutinskih, te 5% do 12% autopsija kod osoba koje su umrle naglom smrću postavlja se dijagnoza miokarditisa. U velikoj seriji umrlih s dilatacijskom kardiomiopatijom kod 9% pato-histološki nalaz je upućivao na kronični miokarditis kao osnovnu bolest. Bi-

Abstract

Pay attention to books on echocardiography. In a principle, they neither include texts nor images dedicated to myocarditis. Echocardiographic myocarditis manifestations are numerous and unfortunately non-specific. Anyway, we wonder when transthoracic echocardiography will be crucial in making a diagnosis.

It is hard to make a myocarditis diagnosis. Acute myocarditis may clinically be manifested with numerous symptoms that often suggest an infectious event with chest pains, and physical examination registers an accelerated heart frequency, irregularity of heart function, heart failure or even cardiogenic shock. Applying electrocardiography, besides tachycardia we may find atrium and ventricular rhythm disorders, AV conduction disorders and changes to ST-segment within the related pericarditis. Patients in routine laboratory diagnostics have increased inflammatory parameters with more or less stressed increase in cardiac necrosis markers. On the chest X-ray the heart shadow may be regularly sized. In 1% to 9% and 5% to 12% of autopsies with persons who died a sudden death, a myocarditis diagnosis is made. In a large series of dead people with dilatative cardiomyopathy, with 9% of them of pathohistologic finding indicated a chronic myocarditis as a basic dis-

opsija miokarda je prema mnogima još uvijek zlatni standard u dijagnostici miokarditisa. Međutim, da li je to baš tako? Koristeći se "Dallas" kriterijima iz 1987. godine koji se temelje na infiltraciji miokarda limfocitima uz oštećenje miocita, a bez znakova ishemije, biopsijom miokarda se tek u 10% do 22% bolesnika može postaviti dijagnoza miokarditisa. Ono što je bitno, negativan nalaz ne isključuje dijagnozu miokarditisa. U dijagnostici su se zadnih godina proširile mogućnosti primjenom magnetske rezonancije i tkivnog doplera srca no u svakodnevnoj praksi ove metode su rijetko dostupne.

Iz ovoga što je rečeno slijedi da da će nam tek nalaz ehokardiografije uzimajući u obzir kliničku sliku, EKG, RTG snimku srca i laboratorijsku obradu uvelike pomoći u postavljanju dijagnoze miokarditisa. Pravovremena dijagnoza i liječenje mogu spriječiti neželjene posljedice.

Miokarditis je upalno zbivanje miokarda s oslabljenom funkcijom miocita uslijed njihovog oštećenja i upalnog "zadebljanja". Cijeljenjem procesa stvara se ožiljno tkivo koje, ako je uvelike zahvatilo miokard, može rezultirati zastojnom srčanom insuficijencijom ili dilatacijskom kardiomiopatijom.

Uobičajena klasifikacija miokarditisa je:

- fulminantni
- akutni
- kronični aktivni
- kronični perzistentni

S ehokardiografskog aspekta miokarditis dijelimo na fulminantni i akutni miokarditis.

Fulminantni miokarditis kao što mu samo ime kaže, nastaje naglo sa izrazito teškom kliničkom slikom do kardiogenog šoka, sa začudo dobrom prognozom,a u pravilu mu četiri tjedna ranije prethodi sindrom "gripe" ili febriliteta. Lijeva klijetka (LV) je uredne dijastoličke dimenzije ili blago dilatiran (5,3±0,9 cm) s početno zadebljalim iv. septumom (1,2±0,2 cm). U ranim stadijima fokalne upalne promjene dovode do žarišnih nekroza i edema miokarda koji u kasnijim stadijima mogu dovesti do globalnog zadebljanja stjenci. Stijenka je zadebljana sitno do grubozrnatih odjeka. Pojačana ehogenost miokarda odraz je intersticijskog edema i inifiltracije miocita. Miokarditis može simulirati asimetričnu ili simetričnu hipertofiju miokarda. Prisutni se segmentalni do višesegmentalni ispadi kinetike uz reduciranu istisnu frakciju i kardijalnu dekompenzaciju s indirektnim pokazateljima plućne hipertenzije i poremećajima dijastoličke relaksacije miokarda. Broj bolesnika s fulminantnim miokarditisom koji u ehokardiografskim kontrolama nakon šest mjeseci pokazuju značajan oporavak sistoličke funkcije iznosi do 57% za razliku od akutnog miokarditisa gdje je oporavak sistoličke funkcije nazočan svega u 20% bolesnika.

Akutnom miokarditisu tek u 21% prethode prodromi "gripe", a simptomatologija je neuporedivo blaža i dugotrajnija u odnosu na fulminantni miokarditis. Kod akutnog miokarditisa LV je dilatiran (6,1±0,8), poprima sferičan oblik, stjenka nije zadebljala, značajno je reducirana sistolička funkcija, a doppler ehokardiografijom registriraju se smetnje dijastoličke relaksacije miokarda i indirektni pokazatelji plućne hipertenziije. Dilatacijom LV stvaraju se uvjeti i za mitralnu regurgitaciju bez elemenata endokarditisa. U slučaju reducirane kinetike ne samo lijeve već i

ease. The myocardial biopsy is, according to many people, a golden standard in diagnostics of myocarditis. However, is it just like that? Using the 1987 "Dallas" criteria based on infiltration of myocardium by lymphocytes thereby damaging myocytes with no signs of ischemia, it is possible to make a diagnosis of myocarditis with 10% to 22% by using myocardial biopsy. The thing that is important, a negative finding does not exclude a myocarditis diagnosis. Regarding diagnostics, possibilities have been expanded during the last few years owing to the application of magnetic resonance and cardiac tissue Doppler, but in daily practice, these methods are rarely available.

The above indicated makes us conclude that only the echocardiographic finding considering the clinical manifestations, EKG, chest X-ray and laboratory tests will greatly help us make a myocarditis diagnosis. A timely diagnosis and treatment may prevent undesired consequences.

Myocarditis is an inflammatory myocardium event with weakened myocytes function due to their damage and inflammatory "thickening. The healing of the process leads to the formation of the scar tissue that if it has greatly affected the myocardium may result in heart failure or dilatative cardiomyopathy.

The usual myocarditis classification is:

- Fulminant
- Acute
- Chronic active
- Chronic persistent

From the echocardiographic aspect, we divide the myocarditis into fulminant and acute mycarditis.

The fulminant myocarditis, as the term suggests, occurs suddenly with especially severe clinical manifestations to cardiogenic shock with a surprisingly good prognosis, and is principally proceeded by a syndrome of flu of febrility some four weeks earlier. The left ventricle (LV) is of normal diastolic dimension or is slightly dilatated (5.3±0.9 cm) with initially thickened iv. septum (1.2±0.2 cm). In early stages, focal inflammatory changes result in focal necroses and myocardium edema that in subsequent stages may lead to global thickening of the walls. The wall is thickened with slight to hyperechoic granular echoes. The increased echogenity of myocardium is the reflection of interstitial edema and infiltration of myocytes. Myocarditis may simulate asymmetric or symmetric hypertrophy of the myocardium. Segmental to multi-segmental kinetics distortions with reduced ejection fraction and heart failure with indirect indicators of pulmonary hypertension and disorders of diastolic myocardial relaxation are present. A number of patients with fulminant myocarditis who in echocardiographic follow-ups following the six months' period who show a significant recuperation of systolic function amounts to 57% unlike the acute myocarditis when the recuperation of the systolic function is present in only 20% of patients.

The acute myocarditis is only in 21% preceded by prodromes of flu and symptomology is much milder and longer compared to fuliminant myocarditis. In case of acute myocarditis, the LV is dilatated (6.1±0.8), it takes up a spherical shape, the wall is not thickened, the systolic function is greatly reduced, and the doppler echocardiography registers disorders of diastolic relaxations of the myocardium and indirect indicators of pulmonary hypertension. The LV dilatation creates the conditions even for mi-

desne klijetke loša je prognoza bolesnika. Neprepoznati i neliječeni akutni miokarditis s vremenom progredira u kronični aktivni ili kronični perzistentni miokarditisa sa terminalnim razvojem dilatacijske kardiomiopatije.

Zaključak: razlikujemo dva ehokardiografska entiteta miokarditisa: fulminantni i akutni miokarditis koji se razlikuju i po kliničkoj slici, kod oba su izraženi znaci reducirane sistoličke i dijastoličke disfunkcije. Fulminantni miokarditis uz održanu dimenziju lijevog ventrikula karakterizira zadebljanje stjenki LV uz sitno do grubo-zrnate odjeke za razliku od akutnog gdje je LV dilatiran, međutim stjenka nije zadebljana. Ehokardiografija je ne samo važna u dijagnostici već i u definiranju tipa miokarditisa što značajno utječe na terapiju. Fulminantni miokarditis povremeno zahtjeva agresivnu imunosupresivnu terapiju, a lijek izbora je kortikosteroid.

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tral regurgitation with no endocarditis elements. In the event of reduced kinetics of not only left but even right ventricle, a patient's prognosis is bad. Unrecognized and untreated acute myocarditis progresses in chronic active or chronic persistent myocarditis with time followed by terminal development of dilatative cardiomyopathy.

Conclusion: We differ between two echocardiographic myocarditis entities: fulminant and acute myocarditis are different in clinical manifestations, the both show signs of reduced systolic and diastolic dysfunctions. Fulminant myocarditis with maintained dimension of the LV characterizes the thickening of the LV wall with slight to hyperechoic granular echoes unlike the acute myocarditis where the LV is dilatated, but the wall is not thickened. Echocardiography is not important only in diagnostics, but also in defining a type of myocarditis which greatly affects the therapy. Fulminant myocarditis occasionally requires an aggressive immunosuppressive therapy and the medicine of choice is corticosteroid.