Aortalna stenoza niskog gradijenta i niskog protoka

Low flow and low gradient aortic stenosis

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Sažetak

Aortalna stenoza predstavlja stanje suženja aortalnog ušća zbog promijenjenih aortalnih zalistaka s posljedičnim otporom protoku krvi kroz valvulu. Najčešći uzroci aortalne stenoze su bikuspidna aortalna valvula s kalcificiranim zaliscima, kalcificirano promijenjena trolisna aortalna valvula te reumatski promijenjena aortalna valvula.

Evaluacija anatomije i stupnja težine stenoze bazira se na transtorakalnoj i transezofagealnoj ehokardiografiji. Standardne projekcije za evaluaciju aortalne valvule su parasternalna duga i kratka os, te apikalni pogled u pet šupljina, iz kojeg se vrši i procjena težine stenoze na osnovu doplerskih parametara. Određivanje težine aortalne stenoze provodi se mjerenjem brzine transvalvularnog protoka, procjenom srednjeg transvalvularnog gradijenta i kalkulacijom površine aortalnog ušća. Brzina protoka kroz aortalno ušće veća od 4 m/s, srednji gradijent tlaka veći od 30 do 40 mmHg i površina ušća manja od 1 cm^2 pokazatelji su teške aortalne stenoze. Najčešće korištena metoda određivanja stupnja težine AS je procjena brzine protoka te maksimalnog i srednjeg transvalvularnog gradijenta. Ove metode su vrlo jednostavne za primjenu u svakodnevnoj praksi i izvrsno koreliraju sa stupnjem težine stenoze. Osnovni preduvjet za interpretabilnost nalaza dobivenih ovim metodama je očuvana sistolička funkcija lijeve klijetke (LV) koja je sposobna producirati dovoljan udarni volumen da se postigne veliki gradijent tlaka. U slučaju umjerene do teške sistoličke disfunkcije LV bez obzira na etiologiju, gradijent tlaka i brzina protoka nisu proporcionalni težini aortalne stenoze i redovito su niži nego kod očuvane sistoličke funkcije. U tom slučaju određivanje težine aortalne stenoze može se procijeniti kalkulacijom

Abstract

Aortic stenosis represents a condition of narrowing aortic mouth due to deformed aortic valves with consequential resistance to the flow of blood through the valve. The most frequent causes of aortic stenosis are the bicuspidal aortic valve with valve calcification, calcification of the tricuspid aortic valve and rheumatically deformed aortic valve.

The evaluation of the anatomy and degree of severity of stenosis is based on transthoracic and transesophageal echocardiography. The standard projections for the evaluation of aortic valve are parasternal long and short axis and apical view in five chambers from which the evaluation of severity of stenosis based on Doppler parameters is performed. The determination of the severity of aortic stenosis is performed by measuring the velocity of transvalvular flow, by evaluating the medium transvalvular gradient and calculation of the aortic valve area. The velocity of flow through the aortic flow higher than 4m/s, the medium pressure gradient higher than 30 to 40 mmHg and the aortic valve area below 1 cm^2 are the indicators of severe aortic stenosis. The most frequently applied method when determining the severity degree AS is the evaluation of the velocity of flow and maximum and medium transvalvular gradient. These methods are very simple for use in a daily practice and are excellent in correlating with the stenosis severity degree. The basic precondition for interpretability of findings obtained by applying such methods is the preserved systolic function of the left ventricle (LV) that may produce a sufficient stroke volume to achieve a great pressure gradient. In the event of moderate to severe systolic dysfunction of the LV irrespective of etiology, the pressure gradient and flow velocity are not proportionate to the se-

površine aortalnog ušća. Metoda izračuna površine stenoziranog aortalnog ušća temelji se na jednadžbi kontinuiteta protoka kroz ušće. Prema toj jednadžbi protok krvi proksimalno i distalno od stenoziranog ušća je jednak. Izračun se može vršiti pomoću maksimalnih brzina protoka (simplificirana jednadžba kontinuiteta) ili mjerenjem integrala brzine i vremena. Uključujući u jednadžbu kontinuiteta poznate parametre (protok krvi proksimalno od stenoziranog ušća mjeren pulsnim doplerom, protok krvi distalno od stenoziranog ušća mjeren kontinuiranim doplerom iz apikalnog prikaza pet šupljina te unutarnji dijametar izlaznog trakta lijeve klijetke mjeren iz parasternalne duge osi), izračunava se promjer stenoziranog aortalnog ušća izražen u kvadratnim centimetrima. Kriteriji za postavljanje dijagnoze teške aortalne stenoze kod niskog protoka i niskog gradijenta tlaka su: kalkulatorna površina ušća aortalne valvule manja od 1 cm^2 uz ejekcijsku frakciju manju od 40% i srednji gradijent tlaka na aortalnoj valvuli manji od 30-40 mmHg.

U nekim situacijama kod vrlo niske ejekcijske frakcije niti ova metoda nije dovoljna za postavljanje dijagnoze teške aortalne stenoze. Tada je indiciran dobutaminski stres test koji se provodi sa početnom dozom od 2,5 mcg/kg/min uz povećavanje doze svakih tri minute sve do 10-20 mcg/kg/min, uz kalkuliranje površine ušća kod svakog povećanja doze. Ukoliko dobutaminskim stres testom dobijemo povećanje aortalnog ušća na više od 1 cm^2, ne radi se o teškoj aortalnoj stenozi, no ukoliko površina ušća ostane ispod 1 cm^2 tada se radi o teškoj aortalnoj stenozi.

Zaključak: Kod oslabljenje sistoličke funkcije LV određivanje brzine protoka kroz ušće i gradijenta tlaka nisu adekvatni pokazatelji stupnja aortalne stenoze. Aortalna stenoza niskog gradijenta i niskog protoka predstavlja izračunatu površinu aortalnog ušća manju od 1 cm^2 uz ejekcijsku frakciju manju od 40% i srednji gradijent tlaka na aortalnoj valvuli manji od 30-40 mmHg.

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verity of aortic stenosis and are normally lower than in case of preserved systolic function. In such a case, determination of the severity of aortic stenosis may be evaluated by calculating the aortic valve area. The method of calculation of the surface of stenosed aortic area is based on the equation of continuity of flow through the mouth. According to this equation, the flow of blood proximally and distally from the stenosed mouth is equal. The calculation may be done by using maximum flow velocities (simplified continuity equation) or by measuring velocity time interval. Including known parameters in the continuous equation (blood flow proximally from the stenosed mouth measured by pulse doppler, the blood flow distally from stenosed mouth measured by continuous doppler from the apical view in five chambers and internal diameter of the left ventricle outflow tract measured from the parasternal long axis) the diameter of stenosed aortic mouth expressed in square meters is calculated. The criteria for making a diagnosis of severe aortic stenosis in case of low flow and low gradient of the pressure are: calculation surface of the aortic valve area below 1 cm^2 with ejection fraction below 40% and medium pressure gradient on aortic valve below 30-40 mmHg.

In some situations, in case of very low ejection fractions not even this method is sufficient for making a diagnosis of serious aortic stenosis. In that case dobutamine stress test is indicated conducted with an initial dosage of 2.5 mcg/kg/min followed by increasing the dosage every three minutes up to 10-20mcg/kg/min thereby calculating the valve area in case of every increase in dosage. If the dobutamine stress test results in an increase in aortic valve area exceeding 1 cm^2, no serious aortic stenosis is concerned, but if the area surface remains below 1 cm^2, then a serious aortic stenosis is concerned.

Conclusion: In case of decreased LV systolic function, the determination of the flow velocity through the aortic valve and pressure gradient is not an adequate indicator of a degree of aortic stenosis. The aortic stenosis of low gradient and low flow represent a calculated surface of the aortic valve area below 1 cm^2 with ejection fraction below 40% and medium pressure gradient on aortic valve below 30-40 mmHg.