Original research-Orijinal araştırma

Rheumatic mitral valve area changes with valsalva maneuver

Romatizmal mitral kapak alanı valsalva manevrası ile değişir

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Abstract

Aim. Mitral stenosis, is still a problem of the world. Echocardiography is accepted as gold standard for the evaluation of mitral stenosis. We aimed to search influence of valsalva maneuver onto measurement of mitral valve area (MVA) by planimetry, oldest method. **Methods.** Sixty consecutive patients with mitral stenosis were enrolled. Valsalva maneuver was performed by patients and measurements were done. **Results.** Mean MVA at baseline was 1.5±0.4cm^2 by planimetry, ranging between 1.3-2.1 cm^2. In the overall group, Valsalva maneuver did not yield any change in MVA by planimetry. Considering other measurements, gradients, SPAP, velocities decreased up on Valsalva maneuver. **Conclusion.** Valsalva maneuver influences echocardiographic measures in patients with mitral stenosis, but not, planimetric valve area

Keywords: Mitral stenosis, mitral valve area, planimetry

Özet

Amaç. Mitral darlığı, halen dünyanın bir problemidir. Ekokardiyografi, mitral darlığının değerlendirilmesinde, altın standart olarak kabul edilmektedir. Biz, valsalva manevrasının en eski yöntem olan planimetrik kapak alanı ölçümüne etkisini araştırmayı amaçladık. **Yöntem.** Mitral darlığı olan 60 ardışık hasta çalışmaya dahil edildi. Hastalara valsalva yaptırıldı ve ölçümler yapıldı. **Bulgular.** Ortalama kapak alanı başlangıçta planimetrik olarak 1,5±0,4cm^2 idi ve 1,3-2,1 cm^2 arasında değişiyordu. Tüm grupta, valsalva manevrası planimetrik kapak alanında bir değişikliğe yol açmadı, ancak, diğer ölçümler, gradientler, sistolik pulmoner arter basıncı, velositeler azaldı. **Sonuç.** Mitral darlığı hastalarında valsalva manevrası ekokardiyografik ölçümleri değiştirir, ancak planimetrik kapak alanı değişmez.

Anahtar sözcükler: Mitral darlığı, mitral kapak alanı, planimetri

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Introduction

Mitral stenosis (MS) is still a significant public health problem in developing countries [1]. The area of the mitral orifice is 4 to 6 cm² and when the valve area decreases below 2 cm², a diastolic pressure gradient between the left atrium and left ventricle appears with a transmitral peak velocity greater than 1 m/s suggesting mitral stenosis [2]. Measuring mitral valve area (MVA) in determining the severity has seemed a more reliable method with overall acceptance [3]. Valsalva maneuver is a helpful noninvasive tool for assessment of diastolic filling of the heart by Doppler echocardiography [4]. Mitral valve area (MVA) in determining the severity of mitral stenosis might be influenced by valsalva, and hence, we aimed to search for the influence of valsalva maneuver onto planimetric methods, used to calculate mitral valve area.

Material and methods

Sixty consecutive patients with rheumatic MS who were admitted to outpatient department of Anadolu hospital were enrolled into the study up on obtaining informed consent. Clinical and echocardiographic data were obtained prospectively by an expert echocardiographer. Patients with severe left sided other valve disease, patients with acute coronary syndromes, and patients with history of cardiac surgery were excluded from the study. All patients underwent echocardiographic examinations with a cardiac ultrasound scanner (Vivid 4, GE) and a 2.5-MHz transducer in the left lateral decubitus position, with utilization of standard views and measurements by an expert echocardiographer according to the recommendations of the American Society of Echocardiography [5]. A 12-lead electrocardiogram was simultaneously recorded for each patient. MVA was determined by 2-dimensional planimetry, obtained by direct tracing of the mitral orifice including opened commissures on a parasternal short-axis view [6]. Transmitral gradient including the mitral peak pressure gradient and mitral mean pressure gradient were calculated by the modified Bernoulli equation at rest [7] and, subsequently, it was repeated during the strain phase of Valsalva maneuver. Systolic pulmonary artery pressure (SPAP) was derived from the tricuspid regurgitation jet velocity with modified Bernoulli equation ($4v^2$) and estimating a right atrial pressure from inferior vena cava collapsibility [8]. All patients were carefully instructed for Valsalva maneuver before and during echocardiography. The Valsalva maneuver, which is expiratory strain, performed against a closed glottis, is a part of dynamic auscultation in cardiovascular practice. Patients were informed to initiate and maintain the strain 15 to 20 seconds after normal inspiration by forcefully blowing into a small caliber tube, connected to an aneroid manometer to maintain a constant expiratory effort equivalent to an intraoral pressure of 40 mmHg during a certain period of time. All tests were repeated during strain phase of Valsalva maneuver.

Statistical analysis:

SPSS 14.0 was used to perform statistics. Paired sample t test was used for evaluation of temporal change of parameters. A p value<0.05 was accepted as significant.

Results

Mean age was 43±11 years (45 females, 15 males). Median NYHA was class II. Mean MVA at baseline was 1.5±0.4cm2 by planimetry, ranging between 1.3-2.1 cm2. Valsalva maneuver did not yield any change in MVA by planimetry. Other measurements, gradients, SPAP, velocities decreased up on Valsalva maneuver (Table 1). Among patients with accompanying trivial-mild or moderate-severe mitral regurgitation, planimetric method seemed resistant to valsalva.

Table 1. Influence of valsalva in whole group.

	Before valsalva	During valsalva strain phase	p for paired samples
Planimetry	1.5±0.4	1.4±0.6	0.513
SPAP	35±16	28±13	<0.001
Mean gradient	5±3	4±3.5	<0.001
Peak gradient	15±7	11±5	<0.001

Discussion

This study evaluated the influence of Valsalva maneuver onto different methods of measuring the valve area and hemodynamics in patients with MS and found that measurement of the mitral valve area by planimetry was not affected by Valsalva maneuver. Plus, in patients who had significant mitral regurgitation accompanying mitral stenosis, planimetric method was the most reliable one. Despite measuring mitral valve area (MVA) in determining the severity seems a more reliable method [2], all echocardiographic methods of MVA measurement in MS have potential intrinsic limitations. Two dimensional echocardiographic planimetry is not always feasible [9],

and is dependent on locating the true mitral orifice in the short axis view and on the use of the proper gain settings [10]. Valsalva maneuver is a complex hemodynamic process that involves 4 phases. It is also well known that alteration of loading conditions during the Valsalva maneuver is a helpful ancillary method in the noninvasive assesment of diastolic filling of the heart by Doppler echocardiography [4]. The period at the end of phase II (the strain phase) is used by clinicians to enhance the accuracy of physical diagnosis. The hemodynamic manifestation of the Valsalva maneuver is in part the result of changes in the venous return accompanying changes in the intrathoracic pressure [4].
In conlusion, we suggest that especially when making a clinical decision, clinicians should be aware that valsalva maneuver as an involuntary strain may occur causing changes in hemodynamics. When, there is discrepancy between hemodynamics and planimetry in an anxious patient, it is rational to trust on planimetric valve area, since it seems resistant to valsalva influences.

References

1. Fieldman T. Rheumatic heart disease. Curr Opin Cardiol 1996; 11: 126-30.
2. Mehlman DJ. Doppler and two-dimensional echocardiographic assessment of mitral stenosis. Echocardiography 1986; 3: 109-18.
3. Messika-Zeitoun D, Iung B, Brochet E, Himbert D, Serfaty JM, Laissy JP, Vahanian A. Evaluation of mitral stenosis in 2008. Arch Cardiovasc Dis 2008; 101: 653-63.
4. Levin AB. A simple test of cardiac function based upon the heart rate changes induced by the Valsalva maneuver. Am J Cardiol 1966; 18: 90-9.
5. Lang RM, Bierig M, Devereux RB, Flachskampf FA, Foster E, Pellikka PA, Picard MH, Roman MJ, Seward J, Shanewise J, Solomon S, Spencer KT, St John Sutton M, Stewart W; American Society of Echocardiography's Nomenclature and Standards Committee; Task Force on Chamber Quantification; American College of Cardiology Echocardiography Committee; American Heart Association; European Association of Echocardiography, European Society of Cardiology. Recommendations for chamber quantification. Eur J Echocardiogr 2006; 7: 79-108.
6. Feigenbaum H. Acquired valvular heart disease. In: Feigenbaum H, editor. Echocardiography. 5 th ed. Philadelphia: Lea and Febiger 1994; pp: 239.
7. Nichol PM, Gilbert BW, Kisslo JA. Two-dimensional echocardiographic assessment of mitral stenosis. Circulation 1977; 55: 120-8.
8. Rivera JM, Vandervoort PM, Mele D, Siu S, Morris E, Weyman AE, Thomas JD. Quantification of tricuspid regurgitation by means of the proximal flow convergence method: a clinical study. Am Heart J 1994; 127: 1354-62.
9. Iung B, Cormier B, Ducimetiere P, Porte JM, Nallet O, Michel PL, Acar J, Vahanian A. Immediate results of percutaneous mitral commissurotomy. A predictive model on a series of 1514 patients. Circulation 1996; 94: 2124-30.
10. Martin RP, Rakowski H, Kleiman JH, Beaver W, London E, Popp RL. Reliability and reproducibility of two dimensional echocardiograph measurement of the stenotic mitral valve orifice area. Am J Cardiol 1979; 43: 560-8.