

DIASTOLIC DYSFUNCTION AFTER ACUTE MYOCARDIAL INFARCTION IN HYPERTENSIVE PATIENTS

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ABBREVIATIONS

Key words: echocardiography, diastolic dysfunction, acute myocardial infarction, arterial hypertension

ABSTRACT

Arterial hypertension represents one of the most important cardiovascular risk factor, strongly correlated with ischaemic heart disease. Diastolic dysfunction is early affected in hypertensive patients, even before left ventricular hypertrophy and it progresses with disease evolution and coronary damage. Acute myocardial infarction with ST-segment elevation is related to increased mortality and morbidity. Diastolic dysfunction appears early after myocardial infarction, but there is limited information related to the exact moment of its beginning or prognosis. Starting from these issues we considered necessary to start this study in which I tried to evaluate noninvasive parameters of filling pressure in 98 hypertensive patients admitted with acute myocardial infarction during the first week of hospitalisation and after one year. The highest mean values of these parameters were found in hypertensive patients with left ventricle hypertrophy hospitalised with acute myocardial infarction with ST-segment elevation who did not match criterias for thrombolitic therapy and in those who received this medication but did not present reperfusion criterias. As a result this group of patients had a more severe evolution.

INTRODUCTION

Before acute myocardial infarction (AMI), hypertensive patients have high filling pressure in left ventricle which is supplementary rised during the infarction by the areas of necrosis and ischemia. The prognosis of degree of diastolic dysfunction is independent of systolic dysfunction. Acute myocardial infarction is characterized by regional myocardial damage that may lead to systolic and diastolic dysfunction. High values of left ventricle end-diastolic pressure in acute phase of myocardial infarction was associated with high mortality.

MATERIAL AND METHODS

Study population consisted of 98 hypertensive patients admitted with acute myocardial infarction with ST-segment elevation.. All were in normal sinus rhythm.

Methods: included:

- Clinical examination
- 12 ECG leads: criterias of acute myocardial infarction, the presence of left ventricular hypertrophy (LVH) or arrhythmias; Holter: the presence of arrhythmias or ischaemia; high resolution electrocardiogram of p wave: the presence of late atrial potentials (LAT) using a Helwet Packard device
- Biological exploration: plasma glucose, LDLc, HDLc, triglycerides, creatine-kinaze (CK), creatine-phosphokinaze-MB(CKMB) and troponin T (TnT), using a CoBAS MIRA system
- Echocardiography: - transthoracic measurement of left atrium volume index (LAVi), left ventricular mass index (LVMI); the presence of complications of myocardial infarction: pericarditis, left ventricular aneurysm, left ventricular dilatation
 - pulsed Doppler evaluation of mitral inflow: E wave velocity (E), A wave velocity (A), A wave duration, isovolumic relaxation time (IVRT) and of pulmonary veins inflow: ar wave duration; ar-A duration assesement
 - continuous Doppler estimation of pulmonary artery sistolic pressure (PAPs)
 - tissue Doppler diastolic velocities evaluation using lateral and medial corner of mitral annulus: velocity of E' wave (E'), velocity of A' wave(A'); E/E' ratio assesement
 - colour Mmode evaluation of flow velocity propagation (vp); E/vp ratio assesement using a Agilent Sonos 5500 ultrasound system. Measurements were performed according to the recommendations of the European Society of Echocardiography.
- Thoracic Electrical Bioimpedance: enddiastolic index (EDI) and thoracic fluid conductivity (TFC) assesement using a Homo Sapiens Hotman TM System.

RESULTS

1 Results from initial assesement (during the first week of hospitalisation)

Early complications: heart failure class III and class IV, pericarditis and left ventricular aneurysm were found more frequently in hypertensive patients with LVH and without reperfusion signs. In this group advanced diastolic dysfunction such as pseudonormal and restrictive were also present in higher percentage. Higher medium values of imaging parameters: LAVi, E/E', E/vp, ar-A duration, PAPs, EDI and TFC, the presence of LAP and in higher percentage were measured in hypertensive patients with LVH who did not received thrombotic therapy or who received this treatment but did not present reperfusion criterias. Results were statistically significant.

2 Results from final assesement (after one year).

Similar results were obtained after one year.

3 Comparisons between imaging parameters in the two reviews: At final evaluation pseudonormal and restrictive patterns of diastolic inflow were more frequent in hypertensive patients with LVH and without reperfusion. Medium values of imaging parameters: LAVi, E/E', E/vp, ar-A duration, PAPs, EDI and TFC, associated with increased filling pressure, were higher in this group; also LAP were found in higher percentage.

4 Correlation between clinical and imaging parameters with stastically significance were found between:

- LAVi and E/E' ratio: echocardiographic aspects, diastolic pattern of mitral inflow, the presence of LAP in both measurements

- E/vp and: heart failure class and left ventricular aneurysm, echocardiographic aspects, diastolic pattern of mitral inflow, the presence of LAP in both estimations, pericarditis
 - ar-A duration and: heart failure class, echocardiographic aspects, diastolic pattern of mitral inflow, the presence of LAP in both measurements, pericarditis and the presence of left ventricular aneurysm in final evaluation
 - EDI and: heart failure class and the presence of LAP in both measurements, pericarditis, diastolic pattern of mitral inflow in first week of hospitalisation, echocardiographic aspects in assessment made at one year.
 - TFC and: heart failure class, diastolic pattern of mitral inflow and the presence of LAP in both estimations, pericarditis and the presence of left ventricular aneurysm in final assessment
- High medium values of LAVi, E/E' and E/vp ratio, ar-A during the first week of hospitalisation were strongly correlated with echocardiographic aspect of dilated cardiomyopathy after one year.

CONCLUSIONS

1. During the first week after acute myocardial infarction in hypertensive patients complications such as: heart failure, angina, pericarditis, left ventricular aneurysm, atrial fibrillation were more frequent in patients with left ventricular hypertrophy and without reperfusion; the most severe forms of diastolic dysfunction: pseudonormal and restrictive were found in this group.
2. Complications such as: heart failure, angina, pericarditis, left ventricular aneurysm, atrial fibrillation were found in higher percentage in patients with restrictive pattern.
4. In hypertensive patients with left ventricular hypertrophy, who did not match criteria for reperfusion or who received this treatment, but did not present reperfusion signs, LAVi, E/E', E/vp, PAPS, ar-A duration, EDI and TFC had higher mean values and indicators of dispersion in both assessments.
5. LAP correlated with the risk of reentrant arrhythmias were more frequent in the same group in both estimations.
6. After one year, advanced class of heart failure and atrial fibrillation were found in higher percentage in hypertensive patients without reperfusion; also, echocardiographic aspects of dilated cardiomyopathy, pseudonormal and restrictive patterns were more frequent in this group
7. Statistically significant correlations between imaging parameters and complications:
 - LAVi, E/E', E/vp, ar-A duration, EDI and TFC and NYHA class of heart failure in both measurements
 - E/vp, ar-A duration, EDI, TFC and pericarditis
 - E/vp and left ventricular aneurysm in both assessments; ar-A duration, TFC and left ventricular aneurysm after one year
 - LAVi, E/E', E/vp, ar-A duration and echocardiographic aspect of left ventricular hypertrophy during the first week of hospitalisation and echocardiographic aspect of dilated cardiomyopathy after one year
 - E/vp, ar-A duration, TFC and diastolic pattern of mitral inflow in both measurements; EDI and diastolic pattern of mitral inflow in first week
 - LAVi, E/E', ar-A duration, EDI, TFC and LAP in both evaluations
8. Increased medium values of some imaging parameters were statistically significant influential in determining the echocardiographic aspect of dilated cardiomyopathy after one year: $LAVi > 32\text{ml/m}^2$, $E/E' > 14$, $E/vp > 1,5$, $ar-A > 25\text{ms}$, $EDI > 60\text{ml/m}^2$.

Final conclusion

I highlighted the presence of early diastolic dysfunction in hypertensive patients with AMI, for which there is little data in the literature in terms of time of appearance and prognosis. I found statistically significant correlations between some echocardiographic parameters of diastolic dysfunction of the VS, and between these parameters and clinical aspects. Originality is the fact that in the short and long term, the clinical course and the diastolic function parameters were influenced by the presence of thrombolytic therapy and reperfusion criterias, but also by the hypertrophy of the left ventricle. Patients with increased left ventricular pressure had more severe evolution.

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Education:

- Elena Cuza High School, biology-chemistry section, 1983 – 1987
- University of Medicine and Pharmacy - Craiova - Faculty of Medicine: October 1990 – October 1996; the average of all studied years: 9,82, write down of diploma exam: 10, the average of qualifying license exam: 9,91
- Cardiology residency: after passing the National Competition for admission, sustained in Bucharest (exam of residency) in February 1997, with Ord. M.S. 274/14.03.1997. April 1997 – March 2002
- Specialist in cardiology - March, 2002, with Ord. MS 256/2002
- Sonographer certification in Echocardiography: UMF “Iuliu Hațieganu”, Cluj-Napoca, April 2004
- Post-graduate in Normal and Pathological Physiology speciality - University of Medicine and Pharmacy – Craiova, Faculty of Medicine. Title of scientific work: Diastolic dysfunction following acute myocardial infarction in hypertensive patients - October 2005
- Sonographer Certification by the Echo Core Lab (ECL) at the Brigham and Women's hospital (Harvard Medical School teaching affiliate) (ALOFT) – April 24, 2006
- Sonographer certification in Doppler Echocardiography: from Basics to Advanced Applications, Bucharest, March, 2007.
- Sonographer certification in transesophageal Echocardiography University Hospital Bucharest, October 2007
- European cardiologist: elected 27 March 2008, Paris, France
- Sonographer certification in vascular echography, UMF “Iuliu Hațieganu”, Cluj-Napoca, May 2008
- Senior cardiologist: September 2008 , University Hospital Elias, Bucharest, with Ord. M.S. 1971/03.12.2008

Other important courses:

- Redefining the management of decompensated heart failure, Rome, Italy, 2003
- Cardiovascular emergency conditions: diagnosis and treatment approaches, Milan, Italy, June 2005
- Doppler Echocardiography: from Basics to Advanced Applications, Bucharest, March, 2007
- Euroson School, Guidelines in Gastroenterological Ultrasound, Craiova, Romania, May - Junie, 2007
- Basic on Good Clinical Practice for Investigators, Bucharest, Romania, June, 2009

Scientific activity

- Developed in student scientific circles, during the residency stages, as specialist and senior cardiologist it was materialized in:

Communicated papers at National and International Congresses or Conference (64)

- With published abstracts in scientific volumes of manifestation from which I quote some works correlated with this study:

National Congresses:

- **Despina Toader**, Rodica Muşetescu, Dan-Dominic Ionescu – *Atrial fibrillation risk in hypertensive patients using P-HiRes*, XLIII-th National Congress of Cardiology, September, 2004, Poiana Braşov, Romanian Journal of Cardiology, volume XIX, Supplement A, ISSN 1583-2996, (second prize of Romanian Society of Cardiology for research in arterial hypertension field)
- **Despina Toader**, Rodica Muşetescu, Dan-Dominic Ionescu – *Correlation between P-HiRes and echocardiographic changes in hypertensive patients*, XLIV-th National Congress of Cardiology, September, 2005, Poiana Braşov, Romanian Journal of Cardiology, volume XIX, Supplement A, ISSN 1583-2996
- **Despina Toader**, O. Istrătoaie, R. Muşetescu, D.-D. Ionescu – *T wave alternans in hypertensive patients with acute myocardial infarction*, XLV-th National Congress of Cardiology, September, 2006, Poiana Braşov, Romanian Journal of Cardiology, volume XXI, Supplement A, pg. A16-A17, ISSN 1583-2996
- O. Istrătoaie, R. Mustafa, **Despina Toader**, D.-D. Ionescu – *Diastolic dysfunction evaluation in coronary patients with long QT sindrom using thoracic electrical bioimpedance* XLV-th National Congress of Cardiology, September, 2006, Poiana Braşov, Romanian Journal of Cardiology, volume XXI, Supplement A, pg. A8-A9, ISSN 1538-2996
- Militaru C., Giucă A., Ungureanu A., **Toader Despina**, Ionescu D-D, *Is there a predictive pattern of p wave signal averaged electrocardiograms for arrhythmias recurrence after cardioversion of persistent atrial fibrillation?* XLV-th National Congress of Cardiology, September, 2006, Poiana Braşov, Romanian Journal of Cardiology, volume XXI, Supplement A, pg. A78-A79, ISSN 1538-2996
- O. Istratoaie, **Despina Toader**, R. Muşetescu, D.-D. Ionescu – *Correlations between MTWA testing and echocardiographic changes in patients posmyocardial infarction*, XLV-th National Congress of Cardiology, September, 2006, Poiana Braşov, Romanian Journal of Cardiology, volume XXI, Supplement A, pg. A104-A105, ISSN 1538-2996
- **Despina Toader**, Rodica Muşetescu, C. Bătăiosu, D.-D. Ionescu – *SAECG in risk assessment of the occurrence of the ventricular arrhythmias in hypertensive patients* XLVI-th National Congress of Cardiology, September, 2007, Poiana Braşov, Romanian Journal of Cardiology, volume XXII, Supplement A, pg. A40-A41, ISSN 1538-2996
- **Despina Toader**, Rodica Muşetescu, E. Belu, D.-D. Ionescu – *Bioimpedance cardiography for evaluation of*

hemodynamic parameters in hypertensive stable heart failure, XLVI-th National Congress of Cardiology, September, 2007, Sinaia, volume XXII, Romanian Journal of Cardiology, Supplement A, pg. A152-A153, ISSN 1538-2996

- Rodica Muşetescu, **Despina Toader**, A. E. Muşetescu, E. Belu, M. Popescu, Laura Purcaru, D. – D. Ionescu – *Correlation between left ventricular mass and extension of coronary disease in hypertensive patients*, XLVI-th National Congress of Cardiology, September, 2007, Sinaia, Romanian Journal of Cardiology, volume XXII, Supplement A, pg. A72-A73, ISSN 1538-2996

- Rodica Muşetescu, **Despina Toader**, A. E. Musetescu, E. Belu, M. Popescu, Laura Purcaru, D. – D. Ionescu *Correlation between ntprobnp and noninvasive evaluation with impedance cardiography in moderate and severe hypertension*, XLVI-th National Congress of Cardiology, September, 2007, Sinaia, Romanian Journal of Cardiology, volume XXII, Supplement A pg. A72-A73, ISSN 1538-2996

- **Despina Toader**, Muşetescu Rodica, E. Belu, D.-D. Ionescu – *Correlations between P-HiRes and tissue Doppler parameters in hypertensive patients*, XLVII-th National Congress of Cardiology, September, 2008, Sinaia, Romanian Journal of Cardiology, volume XXIII, Supplement A pg. A125-A126, ISSN 1538-2996 (second prize of Romanian Society of Cardiology for research in arterial hypertension field)

- Muşetescu Rodica, **Toader Despina**, Popescu Monica, E. Belu, D.-D. Ionescu – *Late atrial potentials and atrial fibrillation risk in hipertensive patients with diastolic dysfunction*, XLVII-th National Congress of Cardiology, September, 2008, Sinaia, Romanian Jouranal of Cardiology, volume XXIII, Supplement A pg. A21-A22, ISSN 1538-2996

- **Despina Toader**, Rodica Muşetescu, Dan-Dominic Ionescu – *Thoracic electrical bioimpedance measurements in left ventricular dysfunction following acute myocardial infarction*, XLVIII-th National Congress of Cardiology, September, 2009, Sinaia, Romanian Journal of Cardiology, volume XXIV, Supplement A pg. A163-A164, ISSN 1538-2996

- **Despina Toader**, Rodica Muşetescu, Dan-Dominic Ionescu, *Evaluation of filling pressure in hypertensive patients using noninvasive methods*, XLVIII-th National Congress of Cardiology, September, 2009, Sinaia, Romanian Journal of Cardiology, volume XXIV, Supplement A pg. A104-A105, ISSN 1538-2996

International Congresses:

- **Despina Toader**, Rodica Muşetescu, Dan-Dominic Ionescu - *Evolution of acute myocardial infarction in hypertensive patients*, Fourteenth European Meeting on Hypertension, June, 2004 Paris, France, Journal of Hypertension, Volume 22, Supplement 2, June, pg S316, ISSN 0952-1178

- Rodica Muşetescu, **Despina Toader**, Dan-Dominic Ionescu - *Risk of sudden arrhythmic cardiac death in hypertensive patients*, Fourteenth European Meeting on Hypertension, June, 2004 Paris, France, Journal of Hypertension, Volume 22, Supplement 2, June, pg S315, ISSN 0952-1178

- **Despina Toader**, Rodica Muşetescu, Dan-Dominic Ionescu - *Correlation between P-wave signal averaged electrocardiography and echocardiographic changes in hypertensive patients*, Fifteenth European Meeting on Hypertension, June, 2005, Milan, Italy, Journal of Hypertension, Volume 23, Supplement 2, June, pg S39, ISSN 0952-1178

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- Rodica Muşetescu, , **Despina Toader**, Dan-Dominic Ionescu - *Left ventricular hypertrophy in hypertensive patients* Fifteenth European Meeting on Hypertension, June, 2005, Milan, Italy, Journal of Hypertension, Volume 23, Supplement 2, June, pg S404, ISSN 0952-1178
- **Despina Toader**, Rodica Muşetescu, Octavian Istrătoaie, Dan-Dominic Ionescu - *T wave alternans testing in patients after acute myocardial infarction*, The 21st Scientific Meeting of the International Society of Hypertension (5th Asian Pacific Congress of Hypertension, 29th Annual Scientific Meeting of the Japanese Society of Hypertension), October, 2006, Fukuoka, Japan, Journal of Hypertension, Volume 24, Supplement 6, December, pg 167-168, ISSN 0952-1178 (participation grant)
- Rodica Muşetescu, **Despina Toader**, E. Belu, A. E. Muşetescu, D.-D. Ionescu - *Rehospitalization in heart failure*, European Congress of Heart Failure, June, 2007, Hamburg, Germany, European Journal of Heart Failure, Supplement 1, June, pg 73, ISSN 1567-4215
- **Despina Toader**, Rodica Muşetescu, E. Belu, M. Popescu, D.-D. Ionescu, *Evaluation the risc of atrial fibrillation in hypertensive patients with ischemic heart disease using P-HiRes*, Seventeenth European Meeting on Hypertension, June, 2007, Milan, Italy, Journal of Hypertension, Volume 25, Supplement 2, June, pg S313, ISSN 0952-1178 (participation grant)
- **Despina Toader**, Rodica Muşetescu, E. Belu, D.-D. Ionescu -*The link between echocardiographic changes and impedance cardiography in hypertensive stable heart failure*, Seventeenth European Meeting on Hypertension, June, 2007, Milan, Italy, Journal of Hypertension, Volume 25, Supplement 2, June, pg S163, ISSN 0952-1178
- Rodica Muşetescu, **Despina Toader**, A.M. Muşetescu, E. Belu, M. Popescu, A. Gavrilă, D.-D. Ionescu – *Correlation between NTproBNP and noninvasive evaluation with impedance cardiography parameters in moderate and severe hypertension*, Seventeenth European Meeting on Hypertension, June, 2007, Milan, Italy, Journal of Hypertension, Volume 25, Supplement 2, June, pg S296, ISSN 0952-1178
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- R. Muşetescu, **Despina Toader**, E. Belu, M. Popescu, D.-D. Ionescu, *P wave high ECG resolution (P-hiRes) and diastolic disfunction in hypertensive patients* - Eighteenth European Meeting on Hypertension, June, 2008, Berlin, Germany, Journal of Hypertension, Volume 26, Supplement 1, pg S282, ISSN 0952-1178
- **Despina Toader**, Rodica Muşetescu, Dan-Dominic Ionescu - *Thoracic Electrical Bioimpedance measurements in left ventricular disfunction following acute myocardial infarction*, Heart Failure Congress, May - June, 2009, Nice, France, European Journal of Heart Failure, Supplement, vloume 8(2), ISSN 1567-4215

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- Rodica Muşetescu, **Despina Toader**, Dan-Dominic Ionescu - *Relation between left atrial volume index and echocardiographic measurements of diastolic dysfunction in first week after acute myocardial infarction*, Heart Failure Congress, May - June, 2009, Nice, France, European Journal of Heart Failure, Supplement, volume 8(2), ISSN 1567-4215
- **Despina Toader**, Rodica Muşetescu, Dan-Dominic Ionescu, *Correlation between impedance cardiography and echocardiographic measurements in evaluating high filling pressure in hypertensive patients*, Nineteenth European Meeting on Hypertension, June, 2009, Milan, Italy, Journal of Hypertension, Supplement 2, pg S112, ISSN 0952-1178, 2009 (participation grant)
- R. Muşetescu, **D. Toader**, D-D Ionescu - *Correlation between NTpBNP and noninvasive methods for evaluating diastolic dysfunction in hypertensive patients*, Nineteenth European Meeting on Hypertension, June, 2009, Milan, Italy, Journal of Hypertension, Supplement 2, pg S264, ISSN 0952-1178
- R. Muşetescu, **D. Toader**, E. Belu, M. Popescu, D.-D. Ionescu, - *Noninvasive monitoring of mitral regurgitation in decompensated heart failure*, Nineteenth European Meeting on Hypertension, June, 2009, Milan, Italy, Journal of Hypertension, Supplement 2, pg S112, ISSN 0952-1178
- **Despina Toader**, Rodica Muşetescu, Dan – Dominic Ionescu - *P wave signal averaged electrocardiogram (P-HiRes) for atrial fibrillation risk evaluation in patients with acute myocardial infarction*, European Society of Cardiology Congress, August - September, 2009, Barcelona, Spain, European Heart Journal Abstract Supplement, pg 210 , ISSN 0195-668x

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- **Despina Toader**, Rodica Muşetescu, Simona Gusti, Dan-Dominic Ionescu - *Atrial fibrillation risk evaluation in hypertensive patients with coronary disease and diastolic dysfunction using P-HiRes*, Archives of the Balkan Medical Union, Celsius Publishing House Edition, March, 2009, volume 44, no1, pg 5 – 9 ISSN 0041 – 6940
- **Despina Toader**, Rodica Muşetescu, Ionuţ Donoiu - *Echocardiographic Assessment of Postmyocardial Infarction Diastolic Dysfunction*, Current Health Sciences Journal, University Medical Edition Craiova, 2009, volume 35, no1, pg 1 -7, ISSN 1454 - 6876
- **Despina Toader**, Rodica Muşetescu, Dan-Dominic Ionescu -*Echocardiographic parameters of diastolic dysfunction in hypertensive patients with acute myocardial infarction*, International Journal of Hypertension, ISSN 0952-1178 (in evaluation)

The National and International participation at scientific symposium, conferences and congresses - over 50 (Romania, Germany, France, Italy, Spain, Japan, etc).

Membership of scientific societies or professional bodies

- Member of Romanian College of Doctors
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- Member of European Society of Cardiology

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