Δυναμική υπερηχοκαρδιογραφία στις μυοκαρδιοπάθειες: έχει θέση και ποια;

ΑΓΑΘΗ-ΡΟΖΑ ΒΡΕΤΤΟΥ
ΕΠΙΜΕΛΗΤΡΙΑ Β’ ΚΑΡΔΙΟΛΟΓΙΑΣ
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ΝΟΣΟΚΟΜΕΙΟ ΑΤΤΙΚΟΝ
The clinical use of stress echocardiography in non-ischaemic heart disease: recommendations from the European Association of Cardiovascular Imaging and the American Society of Echocardiography
Stress test beyond regional wall motion abnormalities

- Dilated cardiomyopathy
- Hypertrophic cardiomyopathy
- Suspected diastolic dysfunction
- Pulmonary hypertension
- Valve disease

- Congenital heart disease
- Athlete’s heart
- Heart Tx

*Wall motion abnormalities may occur in these patients too*
Stress echo in non ischemic Cardiomyopathies
Why ?

• Elucidate symptoms (dyspnea, presyncope, syncope)

• Independently quantify contractile reserve (SV, CO)

• Assess functional impact of underlying conditions (valve disease)

• Assesses dynamic changes in the underlying condition (HCM, MR)
Forms of stress

Tailored to question and abilities of the patient:

**Treadmill stress:**
- Functional capacity
- Explanation of exertional symptoms
- Hemodynamics recorded post exercise
- CAD?

**Bicycle stress (semi-recumbent preferred):**
- Functional capacity
- Explanation of exertional symptoms
- Hemodynamics during exercise √ BUT consider loading conditions
- CAD?
Forms of stress

**Pharmacologic stress testing** helps:
– Assess contractile reserve
- Identify concomitant coronary disease
– Limited use for other applications
- Confounding influence of pharmacologic agents
Identify priorities

- May be difficult to assess more than one hemodynamic parameter at a time

- Modify protocols as needed

- Is difficult (impossible) to perform diagnostic test for ischemia during test performed for other primary endpoints
Hypertrophic Cardiomyopathy
Stress test in HCM

- Inducible gradient - *do not stress if resting gradient >50mmHg*
- IIa(B) indication (ACC/AHA Guidelines)
- ± β blocker
- Mitral regurgitation
- Diastolic function (E/e’), PASP
- Regional dysfunction
Stress test in HCM Protocol

- Treadmill, bicycle stress
- Stand post initial recumbent evaluation
  - LVOT gradient >50 mmHg prognostically important
  - MR
  - Lack of contractile reserve
  - BP response
- Note: Need to avoid MR jet
Stress test in HCM

- SE is not indicated when a gradient ≥ 50 mmHg is present at rest or with Valsalva manoeuvre.
- Dobutamine stress test is not recommended:
  - It is not physiological.
  - Poorly tolerated.
  - LVOTO can be induced in normal subjects.

European Heart Journal – Cardiovascular Imaging
2016;17: 1191–1229
68 patients with HC underwent dipyridamole stress test
74 healthy controls
22 months follow-up
Exercise echocardiography and cardiac magnetic resonance imaging to predict outcome in patients with hypertrophic cardiomyopathy†

Jesús Peteiro1, Xusto Fernandez2, Alberto Bouzas-Mosquera1, Lorenzo Monserrat2, Cristina Méndez3, Esther Rodríguez-García3, Rafaela Soler3, David Couto1, and Alfonso Castro-Beiras1

ExE and CMR were performed in 148 patients with HCM.
7 year follow up

Results: Peak WMSI correlated with LGE and with perfusion defect area.

Eur Heart J Cardiovasc Imaging. 201516(4):423-32
Stress echo in Dilated Cardiomyopathy
Patients with significant improvement in their wall motion score index and LVEF during dobutamine infusion have a better prognosis:

- **Survival rate**
- Fewer hospitalizations for HF
- Increase in the LVEF during follow-up
Early reduction in left ventricular contractile reserve detected by dobutamine stress echo predicts high-dose chemotherapy-induced cardiac toxicity

Matthew Civelli, MD, PhD, et al.

In patients undergoing HDC, low-dose DSE allows the early identification of patients at a high risk of developing cardiac dysfunction.

Civelli et al. Int J Cardiol. 2006
Myocardial contractile reserve under low doses of dobutamine and improvement of left ventricular ejection fraction with treatment by carvedilol
Forty-two patients with NYHA III–IV and a left ventricular ejection fraction (EF) 25 ± 6%, were randomised to levosimendan 0.1μg/kg/min (n= 21) or placebo for 24 h

Results: there was a greater increase in CF-Vmax (43 ± 23 vs. 25 ± 8 cm/s), and EF and a greater decrease in BNP, pulmonary artery systolic pressure and E/E’ after levosimendan than after placebo (p <0.05)
Dynamic Left Ventricular Dyssynchrony Assessed on 3-Dimensional Speckle-Tracking Area Strain During Dobutamine Stress Has a Negative Impact on Cardiovascular Events in Patients With Idiopathic Dilated Cardiomyopathy

Kensuke Matsumoto, MD; Hidekazu Tanaka, MD, PhD; Tatsuya Miyoshi, MD; Mana Hiraishi, MD; Akihiro Kaneko, MD; Yuko Fukuda, MD; Kazuhiro Tatsumi, MD, PhD; Hiroya Kawai, MD, PhD; Ken-ichi Hirata, MD, PhD

- Dynamic dyssynchrony is a potential predictor of cardiovascular events in patients with DCM
- Assessment of dynamic dyssynchrony in combination with contractile reserve may further improve prognostic risk stratification
Myocardial contractile reserve during exercise predicts left ventricular reverse remodelling after cardiac resynchronization therapy

Patrizio Lancellotti, Mario Senechal, Marie Moonen, Erwan Donal, Julien Magne, Eric Nellesen, Emilio Atienza, Bernard Cosyns, Pierre Melon, and Luc Piérard

51 patients with heart failure underwent exercise echocardiography before CRT implantation

*global contractile reserve*
*local contractile reserve* in the region of the LV pacing lead

European Journal of Echocardiography 2009 10, 663–66
Diastolic stress
Exer. Average E/e’ > 14 or Septal E/e’ ratio is > 15
& Exer. Peak TR velocity > 2.8 m/sec
& Rest septal e’ velocity < 7 cm/sec or lateral e’ < 10 cm/sec
Protocol

• Bicycle stress, treadmill, passive leg lift
• HR 100-110 avoids E and A fusion
• Normal: E/e’<10 and TR jet <2.8 at rest and exercise
71-year-old man with exertional dyspnoea
Another 70-year-old man with exertional dyspnea
Stress

E/e´avg 8.6
Symptoms possibly not related to diastolic dysfunction
Clinical outcomes of exercise-induced pulmonary hypertension in subjects with preserved left ventricular ejection fraction: implication of an increase in left ventricular filling pressure during exercise

Chi Young Shim, Sung-Ai Kim, Donghoon Choi, Woo-In Yang, Jin-Mi Kim, Sun-Ha Moon, Hyun-Jin Lee, Sungha Park, Eui-Young Choi, Namsik Chung, Jong-Won Ha

498 subjects underwent supine bicycle exercise test
- exercise-induced PH PASP≥50 mm Hg at 50 W
- e/e’ ≥ 15
- 41 months follow up

Heart 2011;97:1417e1424
Conclusions

- Exercise is the test of choice for assessing symptoms in patients with HCM and diastolic heart failure and normal or equivocal diastolic function during resting images.

- Dobutamine is the preferred alternative modality for the evaluation of contractile reserve in DCM patients.

- Vasodilation for the evaluation of coronary flow reserve provides prognostic data in cardiomyopathies.

- Variables that are of diagnostic importance according to the patient examined should be recorded.
Conclusions

- Exercise echo is useful for diagnosis and monitoring of patients with HCM;
  - abnormal BP response to exercise
  - Dynamic LVOTO
  - absence of contractile reserve
  - increase of MR

- The absence of contractile reserve is a strong determinant of outcome and a potential marker of response to cardiac resynchronization therapy in dilated cardiomyopathy
THANK YOU FOR YOUR ATTENTION